growth areas AUTHORITY

Biodiversity Assessment Report (Native Vegetation)
PSP 16: Cranbourne North

July 2010

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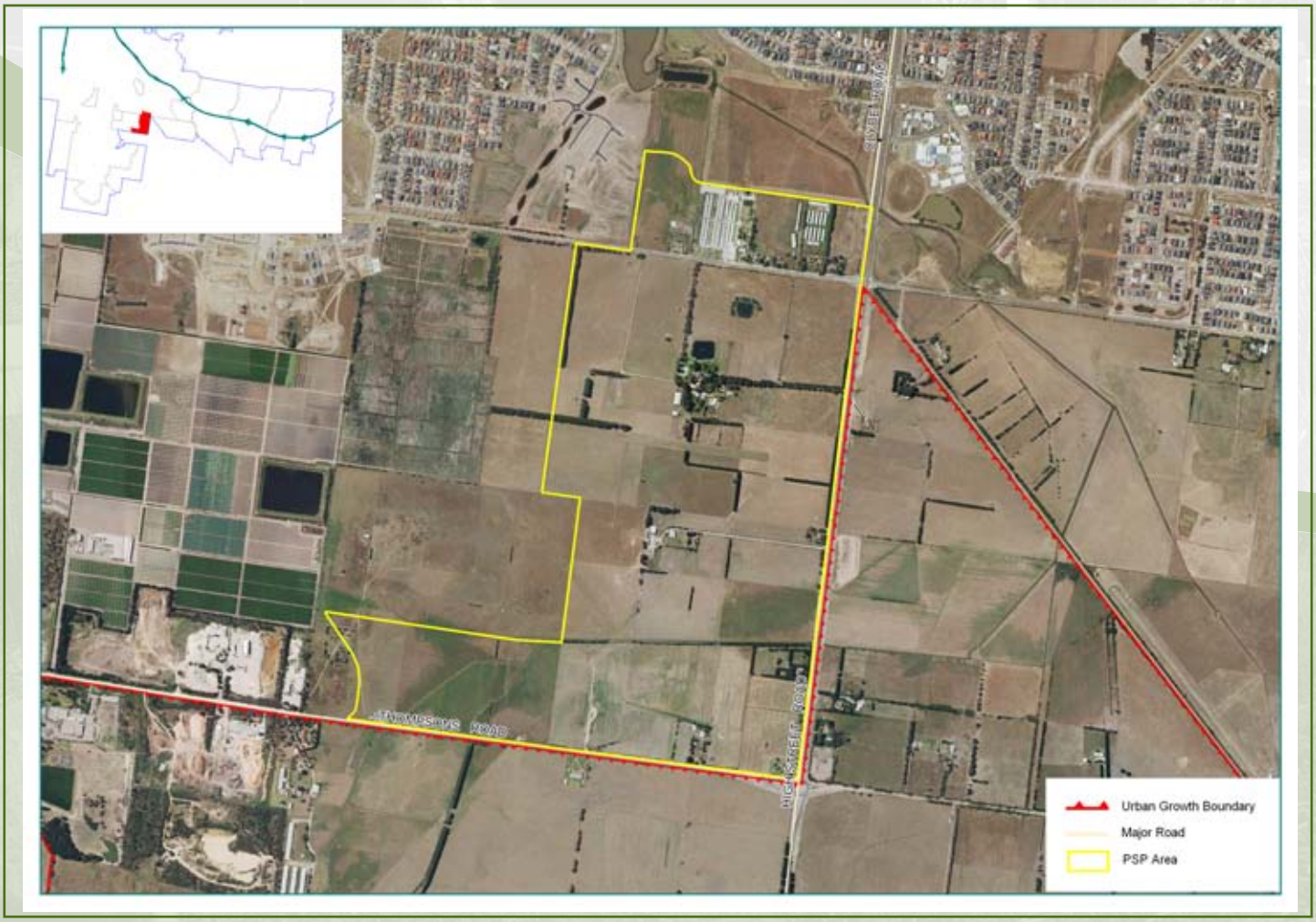
Biodiversity Assessment Report (Native Vegetation)

PSP 16: Cranbourne North

Growth Areas Authority

September 2010



MAP: PSP 16 - Cranbourne North

Biodiversity Assessment Project (Native Vegetation)
Quality Assurance - Verification Sheet
PSP 16: Cranbourne North

Document Title	Biodiversity Assessment Report (Native Vegetation)		
Precinct (Name and Number)	PSP 16: Cranbourne North		
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This document is approved for release	Organisation
	Growth Areas Authority : …… Director, Policy and Strategy Date: …3… / …9…/ …2010…
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Quality Control: Report Verification Checklist			
Name of Company		**Practical Ecology**	
		Date	**Verifier**
Contract Signed		August 2008	Bill Vasiliadis
Habitat Hectare Competency Training Completed		August 2008	Mark Shepherd
Survey Period	**Start**	September 2008	Mark Shepherd
	Completed	May 2009	Mark Shepherd
Vegetation Assessment Surveys completed in accordance with DSE's Vegetation Quality Assessment Manual Version 1.3 (2004)		December 2009	Mark Shepherd
Mapping completed to agreed standards			
Data authenticated by DSE		June 2009	Simon Denby
Habitat Hectare Assessment completed using 'Habitat Hectares for ArcPad' in accordance with agreed DSE approved methodology		December 2009	Mark Shepherd
Targeted Fauna surveys completed in accordance with agreed with DSE's Vegetation Quality Assessment Manual Version 1.3 (2004)			
Survey Results not included with this Report		General fauna survey for species not listed as state or nationally significant	N/A
Internal Quality Control completed		July 2010	Mark Shepherd
Final Report completed		July 2010	Mark Shepherd

Biodiversity Assessment Report: Flora and Fauna Assessment and Mapping Precinct 16, Cranbourne North (Stage 2)

12 July 2010

Part 1 (Background and Purpose) by Growth Areas Authority.
Part 2 (Flora) and Part 3 (Fauna) by Mark Shepherd, Joanne Henry & Peter Gannon.

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Prepared for:	Growth Areas Authority	PE project number:	GAA 1047
Contact:	Bill Vasiliadis	PE file location:	R:\AAAA Major Clients - Projects\GAA\Biodiversity Reports\combined reports\Precinct 16 DRAFT\Final draft\Precinct 16 flora and Fauna FINAL_7Dec09.doc

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1	22 June 2009	Belinda Smith, Clare White & Lyndal McDonald
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3	30 April 2010	Scott Waterhouse, Gillian Christie
4	12 July 2010	

Internal review and auditing of this report for quality control was conducted by Peter Gannon.

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Practical Ecology

Staci Timms undertook GIS data processing and created maps for the report.

Joy MacDonald, Jeremy Neal, Greg James, Mark Shepherd and David Fairbridge undertook habitat hectare assessments.

Lincoln Kern provided project support and guidance.

Jane Juliff and Michael Reynolds provided technical assistance.

Nic McCaffrey assisted with 'likelihood of occurrence' ratings of significant flora.

Mal's Ecological and Environmental Services

Malcolm Legg undertook targeted survey for threatened fauna and provided likelihood of occurrence ratings for threatened fauna

Ecocentric Environmental Consulting

Peter Gannon undertook habitat hectare assessments.

Growth Areas Authority

Yong Zhou provided *Land Subject to Inundation Overlay* and *Precinct Structure Plan* areas as GIS layers.

Department of Sustainability and Environment

Biodiversity Information Group provided access to their ecological databases; Victorian Flora Site Database (VFSD) and Atlas of Victorian Wildlife (AVW).

EXECUTIVE SUMMARY

Practical Ecology Pty Ltd was commissioned by Growth Areas Authority to undertake a targeted flora and fauna survey, and habitat hectare assessment within Precinct Structure Plan (PSP) area 16; *Cranbourne North (Stage 2)*, Victoria. The purpose of this report is to provide information on the flora and fauna species, Ecological Vegetation Classes (EVCs), and fauna habitats occurring or predicted to occur within the precinct, as background information to a Precinct Structure Plan and associated rezoning for the *Cranbourne North (Stage 2)* PSP area 16.

PSP area 16 is located in the suburb of Cranbourne North, within the City of Casey, in Melbourne's south eastern growth corridor (Figure i). Cranbourne North (Stage 2) is approximately 190 ha and is surrounded predominately by agricultural land to the south and east, and urban development to the north and east. The study area consists of approximately 18 privately owned properties and includes adjacent road reserves. The majority of the study area is currently being used for grazing livestock and features large open paddocks with some indigenous trees and planted vegetation.

During the course of this investigation, the PSP boundary was revised to exclude certain parcels in the northern and western sections of the study area. This report presents results relevant to the revised study area. Two significant fauna species were recorded within the areas now excluded from the current study area during the study. Potential habitat for these species within the current study area is discussed in this report. All maps within this report display the revised (and current) PSP boundary.

Much of the study area is covered by a 'Land Subject to Inundation Overlay' (LSIO) (DPCD 2009). The LSIO occupies approximately 74 hectares of the study area.

Flora

Native vegetation occurs in roadsides, farm dams and in grazed paddocks within the study area. Farm dams in the north of the study area comprise Tall Marsh EVC, while other remnants comprise modified Swamp Scrub, Plains Grassy Woodland and Swampy Woodland EVCs.

A total of **1.45 hectares** of native vegetation comprising **0.30 habitat hectares** was defined as meeting DSE's (2004) native vegetation cover thresholds within the study area. Four EVCs were recorded and mapped within the study area. All EVCs occurring within the study area have an *Endangered* conservation status in the Gippsland Plains bioregion. No scattered trees were recorded within the study area.

Habitat Zones within the study area include:

- Tall Marsh within farm dams in the north of the site
- a Swampy Woodland remnant within the Clyde road roadside reserve

- one small patch of Swamp Scrub
- tree-less Plains Grassy Woodland comprising regenerating indigenous herbs and grasses within paddocks in the south-east of the study area

Non-indigenous vegetation comprises planted non-indigenous Eucalypts and other established trees along fence-lines and roadsides. Drainage lines, wetlands and roadsides include areas of modified native vegetation that comprise the floristic components of Swamp Scrub and other EVCs, but do not meet DSE's cover thresholds. Large areas of agricultural land dominate the study area and comprise little native vegetation, with the exception of regenerating Plains Grassy Woodland in the south-east of the study area.

No flora species of national or state significance were recorded within the study area, during the current assessment. Six EPBC Act 1999 listed flora species of national significance have been predicted to occur on site, or within a 5km radius, by the *Protected Matters Search Tool* (DEWHA 2009a). Of these, one species has been assigned a moderate likelihood of occurrence, River Swamp Wallaby-grass *Amphibromus fluitans.* Nineteen FFG Act 1988 listed flora species of state significance recorded on the Flora Information System (FIS) database on site or within a 5km radius. All FFG-listed species were determined to have a low likelihood of occurrence in the study area

Fauna

Targeted surveys were undertaken for the following state and nationally listed threatened fauna species:

- Australian Grayling *Prototroctes maraena*
- Dwarf Galaxias *Galaxiella pusilla*
- Glossy Grass Skink *Pseudemoia rawlinsoni*
- Growling Grass Frog *Litoria raniformis*
- Southern Brown Bandicoot *Isoodon obesulus obesulus*
- Southern Toadlet *Pseudophryne semimarmorata*
- Swamp Skink *Egernia coventryi*

A total of 46 fauna species were recorded within the study area during the current assessment, comprising one amphibian, no reptiles, 39 birds, no invertebrates, no fish and six mammals. Thirty-six species (73%) are native, while 10 species (27%) are introduced.

No state or nationally significant fauna species were recorded within the study area. However, two state significant species, Cape Barron Goose *Cereopsis novaehollandiae* and

Eastern Great Egret *Ardea modesta*, were recorded outside the current study area during the study (Figure 2 Table 4). A further two fauna species recorded during the current assessment are considered to be of regional significance (Table 4).

Four significant fauna species have been recently recorded by Practical Ecology within 300 metres of the study area in adjacent Precinct and Investigation Areas. These species include:

- Australasian Shoveler *Anas rhynchotis*
- Hardhead *Aythya australis*
- Royal Spoonbill *Platalea regia,* and
- Southern Toadlet *Pseudophryne semimarmorata*

Potential habitat for these species occurs within farm dams and drainage-lines within the study area.

Surveys for other state and nationally threatened species were not commissioned by Growth Areas Authority. These include Swift Parrot *Lathamus discolor* and a suite of other threatened woodland and wetland birds, some of which have a high likelihood of occurrence within the study area. Furthermore, general surveys for species not listed as state or nationally significant were not commissioned by Growth Areas Authority.

Forty-eight fauna species of national or state significance have been recorded within a five kilometre radius of the study area (DSE 2005c) or have been predicted to occur within five kilometres by DEWHA (2009a). Nine species recorded on AVW and EPBC searches are considered to have a high likelihood of occurrence within the study area. A further 13 threatened species are considered to have a moderate likelihood of occurrence within the study area. Many of these species are wetland birds that are likely to utilise the farm dams and marshy pastures within the study area.

There are drainage-lines and roadsides that do not meet the DNRE (2002) native vegetation cover threshold, some of which comprise remnant or regenerating indigenous vegetation (particularly Swamp Paperbark *Melaleuca ericifolia* and Common Reed *Phragmites australis*). These areas, and many other areas dominated by introduced flora, are generally considered habitat for some threatened fauna species.

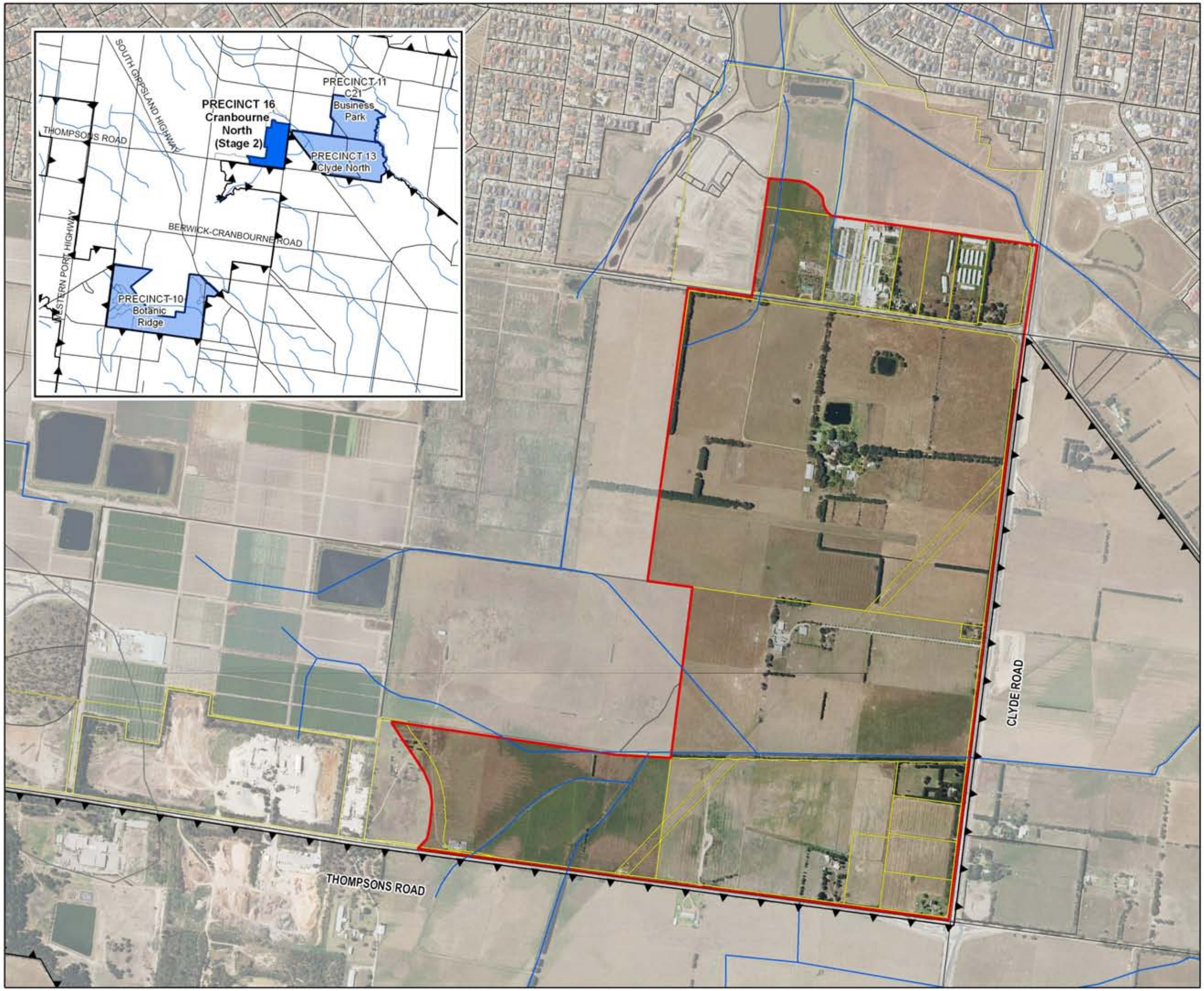

FIGURE i

Location and Overview Map

Biodiversity Assessment Report
Fauna Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Urban Growth Boundary
- Property Boundary
- Precinct Boundary

MAP AND SURVEY DETAILS

Mapping by: Staci Timms, May '09
Generated from: GIS layers and Aerial Photography, supplied by DSE, GAA, ESRI and Geosciences Australia.

DATUM: GDA 94 MGA Zone 55

N

NOTES:

Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

VERSION	03	DATE	29/04/10

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Part 1

Background and Purpose

Precinct Structure Plan area 16;

Cranbourne North (Stage 2)

1. BACKGROUND AND PURPOSE

1.1 Study Area

Precinct Structure Plan (PSP) area 16; *Cranbourne North (Stage 2)*, is located within the suburb of Cranbourne North (Stage 2), within the City of Casey in Melbourne's south eastern growth corridor (Figure 1). Cranbourne North (Stage 2) referred to hereafter as *Precinct 16*, is 190 hectares in area and is bounded by residential development to the north, Berwick-Cranbourne road and Clyde road to the east, Thompsons road to the south and by Precinct Structure Plan area 16 *Cranbourne North (Stage 1)* to the west. The study area is surrounded predominately by agricultural land to the south, east and west and by residential development to the north (Figure 1).

The study area consists of approximately 18 privately owned properties and includes adjacent road reserves. The majority of the study area is currently being used for grazing stock and features large open paddocks with some indigenous scattered trees. Native vegetation is common in roadsides and within farm dams. Parts of the study area are include non-indigenous and planted exotic vegetation.

Areas surrounding drainage lines within the study area are covered by a 'Land Subject to Inundation Overlay' (LSIO) (DPCD 2009). There are no Biosites, as defined by DSE (2005b), found within the study area.

The study area falls within the Gippsland Plains Bioregion (DSE 2009a).

Growth Areas Authority advised Practical Ecology at the conclusion of field work that the Precinct 16 boundary had undergone revision and that certain parcels that were included within the flora and fauna survey are no longer included within Precinct Structure Plan area 16. The parcels excluded from the Precinct after the boundary revision are at the northern and western extremities of the former study area (Figure 1). The study area referred to in this report is consistent with the new Cranbourne North Stage 2 Precinct Structure Plan area, which excludes the parcels in the northern and western extremities. All maps and data within this report are consistent with the revised PSP boundary.

1.2 Project Scope

The Growth Area Authority (GAA) engaged contractors during 2008 / 2009 to map and assess native vegetation and fauna habitat in designated Precinct Structure Plan areas surrounding Melbourne. The scope and design of this project was developed jointly with the Department of Sustainability and Environment (DSE). The purpose of this mapping and assessment process was to:

- Prepare biodiversity reports as essential background input into precinct structure planning at an early stage in the planning process;

- Inform the preparation of precinct structure plans in areas designated for future urban development (in most cases this will also include preparation of a Native Vegetation Precinct Plan);

- Identify priorities for protection and enhancement of biodiversity including potential reserve areas, biodiversity corridors and areas with potential to provide offsets for vegetation lost as a result of urban development;

- Assist long term planning related to infrastructure including liaison with relevant service authorities to ensure their requirements are met over the next 30-50 years.

This new approach focuses on achieving the objectives of the Victorian Native Vegetation Framework and planning development within the Urban Growth Zone at a regional level. This approach will improve the clarity and flexibility of native vegetation management, reduce the administrative burden on local government, provide greater certainty for urban development and improve biodiversity outcomes.

The mapping and assessment undertaken as part of this project has been undertaken in sufficient detail and of a sufficient standard to be used for the preparation of Native Vegetation Precinct Plans and Precinct Structure Plans.

The contractors assessed and mapped vegetation within existing precinct planning areas inside the Urban Growth Boundary (UGB). Contractors were required to submit a GIS data layer of all site assessments, together with other site information and observations on a monthly basis. The site assessments included:

- The extent of native and non-native vegetation

- Mapped polygons of sites / zones

- Confirmation of the native vegetation type (EVC)

- Native vegetation condition assessment (Habitat Hectares site and landscape context score) and other site attributes including land use, dominant weeds etc.

- The genera, size (small, medium, large and very large) and location of all remnant indigenous scattered trees

- The number and size (small, medium, large and very large) of trees within vegetation patches that meet DSE's benchmark definition of a canopy species

- The location of all observed rare or threatened plants or observed native flora

- The location of all observed rare or threatened native fauna or habitat and land use features for fauna

The outputs of the Vegetation and Fauna Assessment and Mapping project will include two parts:

PART A: Vegetation condition, Rare or Threatened Flora species, Habitat and Land Use Features.

PART B: Fauna Surveys.

After consideration of the maps, information and records collected in Part A above and - existing data and fauna and mapping provided by DSE - GAA in consultation with DSE proposed to identify Study Sites for a general assessment of fauna and habitats.

This original approach to Fauna surveys was amended through negotiation with, and agreement of, the DSE to a targeted approach to survey for significant species. The specifications for these surveys are outlined in Flora Appendix 1 of this report.

The priority for 2008 / 2009 was to assess areas for the next group of precinct structure plans, including PSP numbers 10, 13, 16, 23, 25, 26, 37, & 40 (total area 6,796 hectares).

1.3 Amended Project Scope

The GAA became aware that the State Government was preparing to commission other major transport infrastructure projects and to plan for the future growth of Melbourne. These proposed projects, all of which were within, or in close proximity to, the GAA study areas, required assessment and mapping of vegetation and fauna. GAA staff negotiated with the Department's responsible for these projects for them to use the established GAA contract and project arrangements to obtain the vegetation and fauna information for their projects.

Additional PSP areas (PSP areas 11 and 4) were contracted to Practical Ecology to be assessed in 2008 for the extent and quality of native vegetation. PSP 4 was later withdrawn (late Nov 2008) as the surveys had been commissioned by City of Cardinia.

The outputs of the Vegetation and Fauna Assessment and Mapping project will also provide some of the vegetation and fauna data for four key Government projects:

- Investigation to plan for the future growth of Melbourne.
- Regional Rail Link between West Werribee and Southern Cross via Tarneit and Sunshine.
- Outer Metropolitan Ring Transport Corridor Reservation Project.
- Ensuring critical grasslands are protected. The State Government is committed to the creation of two large areas as grassland protected areas.

Only Project No. 2 (above) directly involved existing PSP areas. The results for these projects will be reported in separate reports being prepared for each Project.

2. PROJECT SPECIFICATIONS AND MANAGEMENT ARRANGEMENTS

2.1 Tenders and Selection of Contractors

The Request for Tender was prepared by Growth Areas Authority jointly with the Department of Sustainability and Environment to ensure that the survey methodologies and all data collected and recorded as part of the project complied with Departmental standards. The Request for Tender was advertised in the Herald Sun and on the VicTender web site on the 23rd July 2008.

The Tenders were assessed against the Evaluation Criteria and 4 Contracts were awarded on the 26th August 2008 for Part A (Vegetation condition/Rare or Threatened Flora species/Habitat attributes and Land Use Features). Two Contracts were also awarded for Part B (Fauna Surveys).

Vegetation Condition Assessment and Mapping

Each contractor identified Habitat Zones (as per the method described in Vegetation Quality Assessment Manual Version 1.3, DSE 2004) within the assigned study sites. Habitat Zones and conducted a habitat hectare assessment using 'Habitat Hectares for Arc Pad'. Each contractor recorded land use, other habitat features, and dominant weed species at each zone. DSE supplied each contractor with 'Habitat Hectares for Arc Pad' which was used when mapping and undertaking habitat hectare assessments.

Contractors undertook a 30 minute assessment to identify and (using a GPS) record: (i) all Victorian rare or threatened species (VROTS); and, (ii) any habitat features for native fauna. A count or estimate of the number of individual VROTS was provided at each recorded point location. DSE provided an assessment sheet for recording habitat and land use features for fauna likely to be present in the study area including hollow logs, tree hollows, litter, rocks and rock walls. This assessment sheet was also made available to load onto PDAs and these land use and habitat attributes were recorded for all properties that have been assessed and mapped.

For scattered trees, contractors identified and recorded the location of all individual indigenous trees encountered within any Habitat Zone, including the genera, diameter at breast height and assessment to determine ecological/ habitat significance.

Targeted Fauna Surveys

Background and Purpose Appendix 1 outlines the agreed approach to surveys for significant fauna species throughout these investigation areas.

2.2 Training of Contractors

The GAA and DSE provided a mandatory (3 day) training course in the assessment methods and tools. The dates for this training course were 27, 28 &, 29 August 2008. This training included habitat-hectare assessments and mapping (to ensure the method is being applied in a consistent manner), use of the Habitat Hectares for Arc Pad software, other data collection requirements, OH&S and landholder engagement.

Staffs of contractors were trained in field situations in Native Vegetation assessment by DSE using the habitat hectare assessment methodology and the use of hand held GPS devices loaded with Arc View software provided by DSE.

2.3 Access to Properties and Communication with Landholders

GAA, in consultation with contractors, developed procedures for access to properties and protocols for contact with landholders. Contractors were provided with GAA authorised identification documentation to be carried by all staff whilst undertaking field surveys. The GAA assisted in the engagement of landholders in the process and facilitated access to properties to undertake site assessments.

A letter explaining the mapping project and requesting access to properties was sent to each landholder and occupier. Fact Sheets explaining precinct structure planning and the vegetation mapping project were also forwarded with the letter to landholders. Land owners were given the choice to make contact with the respective contractor to arrange access to their property. Contractors also spent considerable resources making contact with land owners and arranging site visits. A small number of landholders refused to provide access to their properties and in some cases the land owner data base did not lead to any contact being made with the land owner or occupier. Contractors provided regular updates as to which landowners had denied the contractor access to their property to conduct a survey.

In cases where access to a property has not been possible, mapping in this report will show the DSE modelled data layer of information and the contractors confirmation of this by a 'drive by' assessment. While this is not ground survey results it provides an indication of likely vegetation and habitat. In some cases, finalisation of the precinct structure plan and /or native vegetation precinct plan will require additional on ground assessment surveys to be undertaken at these properties.

2.4 Access to Existing Reports and Databases

In some parts of the precinct planning areas flora and/or fauna surveys had been previously arranged by landholders, councils or property developers. GAA, where possible, sought access to these reports and provided a copy to the relevant contractor. DSE staff also provided copies of reports that they knew existed for some of these areas.

Contractors were provided with a copy of, or access to, the DSE corporate flora and fauna databases, including the Atlas of Victorian Wildlife, Flora Information System and Aerial photography. Access to landholder and property information was arranged through DSE and in some cases a contractor was engage to compile a telephone contact database to enable contractors to contact property owners.

2.5 DSE Quality Assurance Arrangements

Field surveys were undertaken by qualified and experienced botanists and ecologists who had participated in the training provided by the DSE as part of this project.

DSE also undertook quality assurance site visits with the contractors to ensure that the assessment methodology was being applied in a consistent manner.

Contractors provided monthly reports to the GAA contract manager including an account of hectares assessed and the data collected. GAA undertook a check of GIS integrity and then arranged for DSE to check the data for its consistency with the *Vegetation Quality Assessment Manual* Version 1.3 (DSE 2004).

Audits of the data files were conducted by DSE to ensure that the records conformed to DSE standards and that all attributes had been recorded accurately.

Any deficiencies were reported to each contractor for correction and improvement prior to acceptance of the results and finalisation of payments.

2.6 Project Governance

A Native Vegetation Project Control Group was established by GAA, which initially included GAA and DSE representatives only. Representatives of VicRoads and Department of Transport were later invited to join the Project Control Group when it was decided that GAA's contractors would be used to undertake the assessment and data gathering for VicRoads and Department of Transport's road and rail project. The Department of Transport also arranged for their project manager (Maunsell) to attend the meetings. The Project Control Group has met regularly since the project commenced.

2.7 Monthly Reporting

Monthly updates and data files were provided on the progress of the assessments along with the contractor's updated project plan to ensure completion of the planned extent of assessment/mapping within the time period provided for the assessment. Initially the assessments were to be completed by the end of December 2008 but the GAA negotiated with contractors to extend the survey deadline into early 2009 to maximise the areas assessed and mapped.

BACKGROUND & PURPOSE APPENDIX 1. TARGETED FAUNA SURVEYS – Specifications for Casey- Cardinia Area

Includes Precincts: Botanic Ridge PSP area 10, Cranbourne North (Stage 2) PSP area 13, Cranbourne North (Stage 2) PSP area 16.

In addition to the targeted survey guidance as outlined in Appendix 2 of DSE's *Draft Flora, Fauna, and Habitat Hectare Assessment Model* please see comments below.

Fauna Species discussed at site visit:

- **Growling Grass Frogs** – ideal time for nocturnal surveying is October to December for calling males – particularly after rain. Survey can be extended until February for nocturnal spotlighting and diurnal surveys. Survey all drainage lines, dams, water bodies, streams, rivers, areas where there is water in all three precincts etc.

- **Dwarf Galaxias, Australasian Grayling** – ideal time is spring when there is permanent water. Survey all areas where there is water.

- **Southern Brown Bandicoots** – survey should occur in winter when the species are active and digging. Survey in areas of potential habitat (where vegetation or habitat structure is apropriate – including patches of weeds) in Botanic Ridge and other precincts with suitable habitat.

  Survey to include:

  - Daytime searches of at least two hours for each site of suitable habitat resources, such as areas with a dense understorey and thick ground cover, perhaps focussing on areas where fire has produced a mosaic of habitat that vary according to time since burning.

  - Daytime searches for signs of activity, including tracks, scats, nests and conical foraging holes. Usually undertaken concurrently with habitat resource searches and recommended survey effort is therefore the same.

  - Collection and analysis of predator scats, owl casts or remains, targeting predatory bird/mammal nests/dens.

  - Multiple spotlight surveys of transects at least 100 m apart in all areas of likely habitat to maximise area surveyed with total transect length of at least 1000m; repeat over two nights and across all seasons if possible to reduce influence of climatic conditions on survey outcome.

  - Additional cage (3 nights in a row) and camera surveys in areas of likely habitat.

DSE has provided information of landholders with records and updated AVW records.

- **Swamp Skink, Glossy Grass Skink**
    - Likely to be present in Botanic Ridge precinct and other precincts if suitable habitat.
    - Pit fall traps/ tiles /metal sheets over summer period in selected areas of potential habitat.
    - If Elliot traps used they should be triggered for the lightest weight possible.
    - They are cryptic species and often missed in targeted survey so very important for ecological assessment of site and potential and likely habitat to be mapped. Often in disturbed areas.
- **Southern Toadlet**
    - Survey in autumn
- **White Footed Dunnart**
    - If there are records around Cranbourne North (Stage 2) then targeted survey in likely habitat.

Part 2

Habitat Hectare Assessment and Targeted Flora Survey

Precinct Structure Plan area 16;

Cranbourne North (Stage 2)

3. FLORA INTRODUCTION

Practical Ecology Pty Ltd was commissioned by Growth Areas Authority (GAA) to undertake a habitat hectare, threatened flora survey and site condition assessment of Precinct Structure Plan area 16 in Cranbourne North, Victoria. The primary objectives of this study are to: establish the distribution, abundance and significance of remnant EVC Habitat Zones; identify threatened flora and significant habitat within the study area; and to present the information within the context of relevant legislation and policy.

This report provides information on significant flora and habitat hectare values within Precinct 16 by:

- identifying the study area's known habitat hectare values and the conservation status therein
- documenting significant flora species that occur or have potential to occur within the study area
- assessing all fieldwork data and information from relevant literature and databases against relevant policy and legislation
- providing recommendations to ensure the study area's significant values are maintained within the context of the proposed future land use.

This information will be utilised by GAA to inform:

- the preparation of a Precinct Structure Plans
- the identification of priorities for protection and enhancement of biodiversity including potential reserve areas, biodiversity corridors and areas with potential to provide offsets for vegetation lost as a result of urban development
- long term planning related to infrastructure including liaison with relevant service authorities to ensure their requirements are met over the next 30-50 years.

4. FLORA METHODS

Flora taxonomy is consistent with the Flora Information System (FIS) database when accessed through Viridans software (DSE 2007a). Taxonomic nomenclature for scientific names is derived from Walsh and Stajsic (2008).

4.1 Literature review and desktop assessment

Background information on the study area's bioregion and EVC distribution (pre-1750, and current) was gathered by literature review prior to site surveys. Planning reports and land management documents were also reviewed. Several GIS mapping layers were provided to Practical Ecology by GAA and DSE and these were incorporated into a GIS. Mapping layers and data sources are detailed below.

Cadastre data and parcel identifiers: the cadastre data, identifying individual land parcels, along with individual parcel identifiers were supplied by GAA/DSE for this project and incorporated into Practical Ecology's GIS.

Bioregion: determined by referring to DSE's *Biodiversity Interactive Map* (DSE 2009a).

Pre 1750 EVCs: determined by referring to DSE's pre-1750 EVC distribution maps (DSE 2009a).

Extant EVCs: the extant EVC GIS mapping layer was supplied by DSE for this project and geo-rectified with the aerials for this study.

Modeled Native Vegetation Extent and Quality: determined by referring to DSE on-line maps and confirmed on site (DSE 2009a).

Biosites: the Biosite25_region mapping layer was not supplied by DSE for this project but was inspected using DSE's Biosite cd (DSE 2005b).

Significant attribute waypoints: the Fauna100_point, Flora100_point and lfw100_point waypoint attribute layers were supplied by DSE for this project and integrated into our GIS of the study area.

Flora Information System (FIS) and Atlas of Victoria Wildlife (AVW): The Flora Information System (DSE 2007a) and Atlas of Victoria Wildlife (DSE 2005c) databases were queried for the study area. The record locations of significant flora and fauna taxa were referred to in the field during the habitat-hectare surveys.

Management reports: A review was conducted of management reports available to us from the region to assist in the pre-survey identification of significant sites and habitat corridors. These reports included McMillan et al (2003), Fairbridge & Appleby (2009), Lane & Associates (2008) and Costello et al (2003).

Site aerials: the study area was previewed prior to site assessment using both Google Earth and aerials supplied by DSE to identify patches of vegetation. Google Earth aerials were also streamed live to a laptop during the site surveys for site identification, and for comparison with more up-to-date DSE aerials for the study area.

Fieldwork: Field survey was undertaken on foot. The majority of survey was undertaken between October and November 2008. However, access to individual properties was dependent on correct landholder contact details and the contactability of landholders, the lack of which prevented contact via telephone in some cases. Certain landholders were therefore contacted in person through 'door knocking'. Circumstances such as these contributed to delays in property access in some cases and resulted in some surveys being undertaken in January. Survey was therefore disjointed and extended over a period of several months. Weather conditions during the survey were therefore varied due to the extended period over which survey was undertaken.

4.2 Flora

Habitat hectare assessments were conducted, on a land parcel by parcel basis, across the study area. The assessments were conducted in accordance with DSE's *Vegetation Quality Assessment Manual* (DSE 2004), *User Guide Habitat Hectares Assessment Sheet for ArcPad 7.1.1 – Version 6* (DSE 2008a) and *GAA Native Vegetation Mapping Project Field Assessment Methodology – Quick Reference Guide* (DSE 2008b). Training was provided by DSE in a three day session at the project's inception. Auditing was undertaken by DSE throughout the fieldwork stage.

Flora data was collected in the field using a hand held Person Digital Assistant (PDA). The Department of Sustainability and Environment (DSE) developed a software application for ArcPad 7.1.1 for the *Growth Areas Authority Native Vegetation and Mapping project* (DSE 2008a) in order to enable the collection of data in the field. DSE's software application enabled the collection of data as outlined in the sections below. The resulting ESRI shapefiles were processed using ArcView V.9 software to re-edit and refine of polygon boundaries, based on hardcopy mapping.

GIS data was submitted to GAA and DSE for monthly review throughout the project. Requested edits were completed and data was resubmitted. At the conclusion of the fieldwork, the monthly data was merged to form a single GIS file, which was exported to into excel spreadsheets for presentation in this report.

The site assessments included:

- mapping the extent of remnant and non-remnant vegetation
- mapping polygons of Habitat Zones, as defined below and in accordance with Victoria's *Native Vegetation Management Framework* (DNRE 2002)

- determination of Ecological Vegetation Classes (EVC)
- native vegetation condition assessment (Habitat Hectares site and landscape context score) and assessment of other site attributes including land-use, habitat attributes and high threat environmental weeds
- the size (small, medium, large and very large) and genera of trees (either as patches or individual trees when scattered in the landscape)
- the location of observed rare or threatened plant species
- the location of incidentally recorded threatened fauna species.

Vegetation in the study area was categorised into remnant Habitat Zones, scattered trees, or Degraded Treeless Vegetation (DTV). These categories and their definitions are consistent with policy and legislation, particularly *Victoria's Native Vegetation Management Framework* (DNRE 2002), and assists in identifying where such policies come into effect.

The following categories were applied.

4.2.1 Remnant Vegetation Patch

- EVCs and Habitat Zones were identified within each patch in accordance with Section 5 of DSE's *Vegetation Quality Assessment Manual Version 1.3* (DSE 2004).
- For each Habitat Zone the Zone Overview data was recorded using DSE's Site Assessment Checklist. Details on the type of information collected is provided in the GAA Vegetation Mapping User Guide, Section 2 – *Collecting Zone Overview data.*
- Each Habitat Zone was mapped and a Habitat Hectares Assessment using DSE's PDA based 'Habitat Hectares for ArcPad' software was conducted in accordance with the GAA Vegetation Mapping User Guide, Section 5 – *Completing a Habitat Hectares Assessment.*
- The number of Very Large Old Trees (VLOTS), Large Old Trees (LOTS), Medium Old Trees (MOTS) and Small Trees (STs) were recorded in the Tree Count Tab of DSE's PDA based 'Habitat Hectares for ArcPad' software (refer to Section 5.6.5 of the GAA Vegetation Mapping User Guide for more information).
- The number of STs cannot be recorded via the Scattered Tree software and was therefore recorded manually and transferred to the Habitas.dbf file (refer to Section 5.6.5 of the GAA Vegetation Mapping User Guide for more information).
- The location of any observed VROT flora was recorded using DSE's PDA based 'tflora_template' shapefile (refer to Section 10 of the GAA Vegetation Mapping User

Guide – *Mapping the Location & Number of all Observed Rare or Threatened Flora* for more information).

- The location of any observed VROT fauna was recorded using DSE's PDA based 'tfauna_template' shapefile (refer to Section 11 of the GAA Vegetation Mapping User Guide, Section 11 – *Mapping the Location & Number of all Observed Rare or Threatened Fauna* for more information).

4.2.2 Scattered Trees

- Scattered tree polygons were assigned in the field and an scattered tree EVC was assigned in accordance with Section 5 of DSE's *Vegetation Quality Assessment Manual Version 1.3* (DSE 2004).

- Scattered tree Zone Overview data was recorded for each scattered tree 'zone' using DSE's Site Assessment Checklist. Details on the type of information collected is provided in the GAA Vegetation Mapping User Guide, Section 2 – *Collecting Zone Overview data.*

- For each Zone map the complete boundary of each Habitat Zone was mapped and a Scattered Trees Assessment was conducted using DSE's PDA based 'Scattered Tree Assessment for ArcPad software in accordance with the GAA Vegetation Mapping User Guide, Section 6 – *Completing a Scattered Tree Assessment.*

- The number of VLOT, LOT, MOT and ST was recorded for each scattered tree zone using DSE's PDA based STLocn_template shapefile in accordance with the GAA Vegetation Mapping User Guide, Section 6 – *Completing a Scattered Tree Assessment*.

- The location of any observed VROT flora was recorded using DSE's PDA based 'tflora_template' shapefile (refer to Section 10 of the GAA Vegetation Mapping User Guide – *Mapping the Location & Number of all Observed Rare or Threatened Flora* for more information).

- The location of any observed VROT fauna was recorded using DSE's PDA based 'tfauna_template' shapefile (refer to Section 11 of the GAA Vegetation Mapping User Guide, Section 11 – *Mapping the Location & Number of all Observed Rare or Threatened Fauna* for more information).

4.2.3 Degraded Treeless Vegetation

- Degraded Treeless Vegetation Overview data was recorded for each site using DSE's Site Assessment Checklist. Details on the type of information collected is provided in the GAA Vegetation Mapping User Guide, Section 2 – *Collecting Zone Overview data.*

- The complete boundaries of each site was mapped the relevant data was recorded using DSE's PDA based 'Habitat Hectares for ArcPad' software in accordance with the GAA Vegetation Mapping User Guide, Section 9 – *Completing a Degraded Treeless Vegetation Assessment*.

- The location of any observed VROT flora was recorded using DSE's PDA based 'tflora_template' shapefile (refer to Section 10 of the GAA Vegetation Mapping User Guide – *Mapping the Location & Number of all Observed Rare or Threatened Flora* for more information).

- The location of any observed VROT fauna was recorded using DSE's PDA based 'tfauna_template' shapefile (refer to Section 11 of the GAA Vegetation Mapping User Guide, Section 11 – *Mapping the Location & Number of all Observed Rare or Threatened Fauna* for more information).

5. FLORA LIMITATIONS

5.1 Flora survey and ecological assessment

Flora lists for each property and for the entire precinct were not commissioned by GAA and were not compiled by Practical Ecology for the study area. No incidental records, flora quadrat or transect analyses were undertaken. Lists of weed species were recorded during habitat hectare assessments and are included as part of the GIS files created during the project. However, these lists were undertaken for the purposes of habitat hectare assessments and were selected from a 'drop-down' list of common weed species. The lists are therefore not exhaustive or necessarily complete records of weed species recorded within the study area, and are therefore not included in this report.

No data other than habitat hectare assessments and site condition checklists was collected during site visits, as per the project brief. Practical Ecology was not commissioned to undertake biodiversity reporting for the study area at the time of the field assessment. Information relating to the general site condition contained within this report is therefore a product of assessor recollection of the study area. Photographs and hard copy mapping of the ecological attributes of the site was not undertaken.

Unseasonably dry and hot conditions during the survey of certain properties in summer presents as a limitation, and may have a minor influence over the results of habitat hectare assessment results.

5.2 Site Access

There were several properties within the study area which did not respond to the GAA's initial contact queries. These properties were later canvassed on foot and permission was sought for access and the conduct of site surveys at some of these properties. This time consuming process contributed to delays in the survey process, and subsequently, resulted a 'temporally and geographically disjointed' assessment across the study area.

The owner of one property, 1105 Glasscocks road, Narre Warren South, refused permission to access. This property is two hectares in area.

5.3 Flora survey for threatened species

The study area was not considered highly likely habitat for threatened flora species, due to the highly modified nature of the agricultural landscape within which it is situated. One threatened flora species that have been recorded within five kilometres (DSE 2007a) or predicted to occur by DEWHA (2009a) has been assigned a moderate likelihood of occurrence. This threatened species is a late spring – autumn flowering species (Walsh &

Entwistle 1994). Searches for threatened flora were undertaken in spring and summer, therefore the timing and temporal extent of threatened flora surveys was not considered a significant limitation for this threatened flora species.

6. FLORA RESULTS

6.1 Remnant Patches

A total of **1.45 hectares** of native vegetation comprising **0.30 habitat hectares** was defined as meeting DSE's (2004) native vegetation cover thresholds within the study area.

Vegetation patches within the study area that constitute Habitat Zones, in accordance with Victoria's *Native Vegetation Management Framework* policy (DSE 2004), are generally small in area, and are generally modified and not contiguous with other Habitat Zones. This was reflected in the relatively low habitat hectare assessment scores, which were generally between 0.1 and 0.3. The scores are a reflection of the highly modified agricultural landscape within which the study area occurs. Low habitat hectare scores can be attributed to, but not necessarily limited to:

- pugging (due to hard hooves) by livestock, particularly within damper soils in the gullies and around marshy areas
- soil disturbance, such as gully erosion, tracks through remnants and areas of exposed soil with little to no vegetative cover
- introduction of grassy weeds, pasture grasses and high nutrient levels
- cropping of tussock grasses and the ground storey vegetation in general
- general absence of regeneration of woody species (due to grazing and rabbits) and subsequently a declining canopy coverage
- loss of middle and ground-storey vegetation resulting in a depauperate native vegetative understorey cover.

6.1.1 Ecological Vegetation Classes

Four EVCs were identified and mapped within the study area. Table 1 summarises EVCs recorded within the study area.

Table 1. Summary of EVCs recorded within the study area.

EVC Name	EVC Number	EVC cons status	Overall cons Sig	Area (ha)	Habit Hectares
Plains Grassy Woodland	GipP0055	Endangered	High	0.510	0.075
Swamp Scrub	GipP0053	Endangered	Very High	0.050	0.005
Swampy Woodland	GipP0937	Endangered	Very High	0.260	0.036
Tall Marsh	GipP0821	Endangered	Very High	0.630	0.185
			Totals	**1.45**	**0.30**

The following EVC descriptions are based on the condition of Habitat Zones found on site, and include more general descriptions referenced from EVC benchmarks available on-line (DSE 2009b) and from Oates and Taranto (2001).

Plains Grassy Woodland (EVC 55)

Plains Grassy Woodland EVC most likely once occupied the majority of the drier, elevated plains sections of the study area south of Glasscocks road prior to European settlement (DSE 2009b). This EVC is effectively all but absent from the precinct, attributable to land clearance and long-term grazing. Some small remnants persist, mostly within pasture (Figure 2).

Plains Grassy Woodland would have once been ecotonal with Plains Grassland within the study area (DSE 2009b). The EVC would likely have presented as an open, eucalypt woodland (to 15m tall) dominated by River Red Gums *Eucalyptus camaldulensis*, with a diverse, grassy and herbaceous understorey and a sparse cover of shrubs (DSE 2009b).

Plains Grassy Woodland within the study area occurs as patches of colonising indigenous herbs and grasses within grazed paddocks at property PFI# 2023469. DSE pre 1750 EVC mapping in combination with understory floristic composition, soil type and elevation were used to determine this EVC as Plains Grassy Woodland, however, the EVC bares little resemblance to the benchmark description of Plains Grassy Woodland.

The EVC is highly modified and suffering from the impacts of weed invasion and other disturbance as a result of agricultural landuse. Mature Red gums were absent from patches and native understory diversity was generally low. All patches scored below 0.20.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Swamp Scrub (EVC 53)

Swamp Scrub is dominated by Swamp Paperbark *Melaleuca ericifolia* or sometimes Woolly Tea-tree *Leptospermum lanigerum* which forms a dense closed canopy. The EVC forms on poorly drained sites or on alluvial deposits along streams and would once have dominated the area to the north of Glasscocks road (DSE 2009b). Swamp Paperbark typically out-competes Eucalypt species, although emergent Swamp Gum *Eucalyptus ovata* may occur. Shrubs are usually absent; while a herbaceous and grassy understorey may be present depending on light availability (Oates & Taranto 2001).

One small patch of Swamp Scrub was recorded in the south-east corner of the study site (Property PFI: 603 236). The swamp scrub canopy is dominated by a closed cover of Swamp Paperbark over an understorey of low diversity. This Swamp Scrub patch scored poorly, due to weed invasion, disturbance and grazing.

Swamp Scrub shows signs of regeneration and colonisation suggesting that this EVC would naturally colonise damp sites and flood zones if left un-grazed and un-slashed.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

Swampy Woodland (EVC 937)

Swampy Woodland would have preferred swampy deposit sites, extending to suitable substrates within some landscapes of sedimentary origin (Oates & Taranto 2001).

The Swampy Woodland EVC was recorded within the Clyde road roadside (at the intersection with Thompsons road). This remnant was highly modified with its eucalypt canopy removed and a high level of weed infestation within the understorey.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2007b).

Tall Marsh (EVC 821)

Tall Marsh generally occurs on Quaternary sedimentary geology of mainly estuarine sands, where soils are peaty, silty clays, and average annual rainfall is approximately 600 mm. It requires shallow water (to 1 m deep) and low current-scour, and can only tolerate very low levels of salinity (DSE 2009b).

Tall Marsh now dominates two large farm dams in the north of the study area. Tall Marsh occurring within the these dams was likely to be the result of natural regeneration. These sites were generally dominated by Cumbungi *Typha* spp. with Common Reed *Phragmites australis* and Club-sedge *Schoenoplectus* spp also present.

This EVC has an 'Endangered' Conservation Status within the Gippsland Plains bioregion (DSE 2009b).

6.1.2 Conservation Significance

Of the 11 patches of vegetation recorded in the study area, seven patches have been assigned **very high** conservation significance, as per Appendix 3 of Victoria's *Native Vegetation Framework* DNRE (2002) (Appendix 2). The remaining four patches have been assigned **high** conservation significance (Appendix 2).

The high and very high conservation significance determinations within the study area are due primarily to the endangered conservation status of the EVCs recorded within the study area, in combination with the recorded presence of best or remaining 50% habitat. 'Other site attributes' have not influenced the conservation significance of any patches.

6.1.3 Vegetation Quality (habitat hectares)

Vegetation quality in terms of habitat hectare scores varies between 0.14 and 0.32 (Appendix 2). The average habitat hectare score is 0.17 within the study area.

The relatively low habitat hectare scores are a reflection of the highly modified nature of the agricultural landscape within which the study area is situated. Landscape scores are ≤5, which is a reflection of a lack of surrounding native vegetation and large conservation reserves within 5km of the study area boundary.

Table 1 presents a summary of habitat hectares assigned to each EVC, while Appendix 2 presents all habitat hectare scores recorded within the study area during the current assessment.

6.1.4 Key biodiversity Issues and Implications

Approximately 1.5 hectares of the 190 hectare study area (less than 1%) comprises native vegetation classified as Habitat Zones (Figure 2). Native vegetation occurs primarily within the farm dams and roadside remnants in the north and south-east of the study area.

Roadsides, fence-lines and drainage lines dominated by exotic vegetation displayed in Part 3 Figure 3 are considered habitat for threatened fauna species within the study area.

A *Land Subject to Inundation Overlay* (LSIO) occupies a substantial section of the study area; up to several hundred metres wide at some points (DPCD 2009). This 74 hectare area represents potential habitat for wetland birds during times of flood. In addition, areas of exotic vegetation surrounding wetland complexes are especially important due to the movement of fauna between water-bodies and the utilisation of inundated pasture near water-bodies by certain wetland birds (Pizzey & Knight 2007) (Part 3 Appendix 2).

6.2 Scattered Trees

No scattered trees', as defined by DSE (2007b) occur within the study area.

6.3 Degraded Treeless Vegetation

6.3.1 Description

Degraded Treeless Vegetation (DTV) dominates the study area in the form of grazing land (Figure 2). DTV within the study area typically comprises exotic pasture grasses, such as Rye grasses *Hordeum* spp., with occasional introduced crop weeds such as Thistles and other broadleaf weeds. Residential areas (including gardens), windbreaks and other areas

vegetated with non-indigenous flora have been included within the DTV classification at the study area.

6.4 Significant Flora Species and Ecological Communities

6.4.1 Listed Ecological Communities

No Listed Ecological Communities listed under the EPBC Act 1999 and the FFG Act 1988 were recorded within the study area.

6.4.2 Nationally Significant Flora Species

Recorded during the current assessment

No nationally significant flora species listed under the EPBC Act 1999 were recorded during the current assessment.

Recorded in 5 km database searches

Six nationally significant flora species listed under the EPBC Act 1999 were predicted to occur by the DEWHA Protected Matters Search Tool within 5km of the study area boundary (DEWHA 2009) (Appendix 1). One nationally significant species, River Swamp Wallaby-grass *Amphibromus fluitans,* was assigned a moderate likelihood of occurrence rating based on the identification of potentially suitable habitat within the study area, and numerous other records within the region.

River Swamp Wallaby-grass *Amphibromus fluitans*

River Swamp Wallaby-grass is listed as *Vulnerable* under the EPBC Act 1999 and is mostly confined to the north-central Victorian reach of the Murray River and is uncommon in southern Victoria. The species is known to occur in a variety of natural and constructed wetlands such as farm dams, lagoons and swamp margins (DEWHA 2009b; Walsh & Entwistle 1994).

River Swamp Wallaby-grass has been recorded in wetlands in Lyndbrook and near the Royal Botanic Gardens Cranbourne (DSE 2007a). Potential habitat exists at farm dams within the study area.

6.4.3 State Significant Flora Species

No State significant flora species listed under the FFG Act 1988 or listed under DSE's Advisory list of rare or threatened plants in Victoria (DSE 2005a) were recorded during the current assessment.

Recorded in 5 km database searches

Nineteen state significance species, listed under the FFG Act 1988 or listed under DSE's Advisory list of rare or threatened plants in Victoria (DSE 2005a), have been recorded within 5km of the study area (source: DSE's Flora Information System (DSE 2007a) (Appendix 1)). All of these species have been assigned a low likelihood of occurrence within the study area; based on the identification of unsuitable habitat within the study area.

7. FLORA LEGISLATIVE REQUIREMENTS

The following section outlines the implications of legislation, treaties, plans, or policies, for habitat-hectare, flora and fauna values found on site.

7.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Act 1999* (EPBC Act 1999) applies to sites where proposed developments or projects may have a *significant impact* on *matters of National environmental significance*.

Under the EPBC Act 1999, the proponent must refer proposed actions that may require approval, to the Commonwealth Environment Minister. The Minister then decides which assessment and reporting option is applied. The Minister may approve a 'controlled action' allowing the development to proceed provided conditions are applied to mitigate significant impacts protected by this act.

Using the Department of Environment, Water, Heritage and the Arts (DEWHA's) Protected Matters Search Tool (DEWHA 2009) six threatened flora species of national significance were predicted to occur within 5km of the study area boundary. Three EPBC listed flora species, River Swamp Wallaby-grass *Amphibromus fluitans*, Maroon Leek-orchid *Prasophyllum frenchii* and Swamp Everlasting *Xerochrysum palustre,* have been recorded within 5km of the study area (DSE 2007a). No listed threatened species or communities were recorded during this survey. One EPBC-listed flora species; River Swamp Wallaby-grass was determined as having a moderate likelihood of occurrence within the study area (Section 6.4). Appendix 1 lists all relevant flora species detected using the EPBC Protected Matters Search Tool (DEWHA 2009a).

7.2 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act 1988) was legislated to ensure the continued survival of all Victorian species of flora and fauna and all Victorian communities of plants and animals. A key component of the FFG Act 1988 is to ensure the sustainable use of flora and fauna resources whether they are threatened or not.

The FFG Act 1988 lists:

- threatened species of flora and fauna
- threatened communities of flora and fauna
- protected flora

- potentially threatening processes

There were no threatened flora species listed under the FFG Act 1988 recorded during this survey within the study area. There are also no listed threatened communities known to occur within the study area. All FFG-listed species were determined to have a low likelihood of occurrence in the study area (Section 6.4).

Protected Flora are species are listed as protected to regulate exploitation including removal from the wild for cultivation and the cut-flower industry. Among others the list includes all members of the Asteraceae (daisies) family, all members of Epacridaceae (heaths), all members of Orchidaceae (orchids) and all Acacias (excluding Silver Wattle, Early Black Wattle, Lightwood, Blackwood and Hedge Wattles). While flora species lists were not compiled for the study area, it is highly likely that a number of species found throughout the study area are listed under the FFG Act 1988 as Protected Flora.

A permit is required if proposed works may kill, injure or disturb listed flora species.

7.3 Planning and Environment Act 1987

The purpose of the *Planning and Environment Act 1987* is to establish a framework for planning the use, development and protection of land in Victoria in the present and long-term interests of all Victorians.

Under the Act a Planning Permit is required for development within Victoria which may have significant effects on the environment, or which the responsible authority considers the environment may have on the use or development. The objectives of planning and the planning framework include (among others):

- To provide for the protection of natural and man-made resources and the maintenance of ecological processes and genetic diversity.

- To establish a system of planning schemes based on municipal districts to be the principal way of setting out objectives, policies and controls for the use, development and protection of land.

- To ensure that the effects on the environment are considered and provide for explicit consideration of social and economic effects when decisions are made about the use and development of land.

- To facilitate development which achieves the objectives of planning in Victoria and planning objectives set up in planning schemes.

Clause 52.17 of the Planning Scheme is the principle action of the Planning and Environment Act within the Scheme relating to native vegetation impacts, unless:

- The application is exempt under the Table of Exemptions 52.17-6 within the Clause.

- A Native Vegetation Precinct Plan applies.

Victoria's *Native Vegetation Management framework* can be triggered by Clause 52.17 and is discussed below. Properties within Precinct 16 that were not subject to a field assessment during the current assessment will be defined in the *Native Vegetation Precinct Plan* as "Areas requiring a permit under Clause 52.17". These properties will be subject to a separate field assessment at permit stage to address Victoria's *Native Vegetation Management framework*.

7.4 Native Vegetation Management Framework

A principle tenet of Victoria's *Native Vegetation Management Framework* is the objective of retention and management of native vegetation (DNRE 2002). According to the DSE (2002:14) the goal of native vegetation management in Victoria is to achieve:

> *A reversal, across the entire landscape, of the long-term decline in the extent and quality of native vegetation, leading to a Net Gain.*

Four individual actions to achieve the above goal are outlined in the DNRE's (2002) Framework. These are:

- active improvement of the quality of existing vegetation,

- avoidance or minimisation of further permanent losses through clearing,

- strategic increase in the cover of native vegetation through biodiverse revegetation, and

- the flexibility that is required to support landholders as they move towards more sustainable land use.

To achieve the most strategic outcome for native vegetation across Victoria the *Native Vegetation Management Framework* embraces a system of classification determining both the land protection and conservation significance of any given site. The Net Gain methodology is intended to provide a systematic approach that ensures the conservation of the majority of remnant vegetation across Victoria. DNRE (2002) has established a three step approach to use when applying the Net Gain process. These steps are:

- To avoid adverse impacts, particularly through vegetation clearance.

- If impacts cannot be avoided, to minimise impacts through appropriate consideration in planning processes and expert input to project design or management.

- Identify appropriate offset options.

The outcome of the Net Gain process is intended to ensure that the most significant vegetation incurs no losses (exceptions may apply) and less significant vegetation is adequately managed through commensurate offsets based on the level of significance. During the planning process, it must be ensured that every effort has been made to avoid clearing remnant vegetation at the outset and, if clearance is unavoidable, impacts have been minimised. Preference must also be given to the avoidance of damage or loss of the most significant vegetation and reduce the amount of overall vegetation cleared.

7.5 Port Phillip and Westernport CMA Native Vegetation Plan

Victoria's *Native Vegetation Management Framework* states that regional vegetation plans will provide regional guidelines for responsible authorities in determining permit applications to remove, destroy or lop native vegetation. The *Port Phillip and Westernport Native Vegetation Plan* (PPWCMA 2006) is to be used as a reference document for the conservation status of native vegetation communities in the region. The *Native Vegetation Plan* represents the minimum requirement for offsets and describes:

- the overall policy response to clearing applications.
- the requirements for offsetting the loss of remnant but relatively intact areas of native vegetation.
- requirements for offsetting the loss of scattered, individual trees of various ages, sizes and growth rates.
- requirements for offsetting the loss of scattered trees smaller than medium old trees and slow-growing tree species.
- requirements for offsetting grass trees and tree ferns.
- requirements for offsetting harvesting of timber from naturally established native forest on private land.

The *Native Vegetation Plan* applies where *parcels of land greater than 4ha with less than 8 scattered trees per hectare* or where *parcels of land less then 4ha with any number of scattered old trees per hectare* (DNRE 2002). This applies to very large, large and medium old trees and any trees less than medium trees.

Appendix 3.4 of the *Native Vegetation Plan* states that "…where protection and recruitment is not required by Victoria's *Native Vegetation Management Framework* and there is no practical way to achieve protection, a *recruitment only offset* may be applied." (PPWCMA 2006). However, it is part of DSE Port Phillip Region's focus to require the *protection and recruitment* prescription in most planning applications (DSE 2007a). Table 3.4C of the

Native Vegetation Plan sets out the offset requirements for the loss of trees of various ages and sizes.

7.6 Wildlife Act 1975 and associated regulations

The purpose of the *Wildlife Act 1975* is to establish procedures in order to promote the protection and conservation of wildlife, prevent wildlife from becoming extinct, and to prohibit and regulate the conduct of persons engaged in activities concerning or related to wildlife. The Act requires people engaged in wildlife research (such as fauna surveys, salvage or translocation activities) to obtain a permit in order to ensure that these activities are undertaken with appropriate conservation and protection measures.

Furthermore, the Act requires that a permit is obtained for the management of wildlife where:

- Wildlife is damaging any building, vineyard, orchard, crop, tree, pasture, habitat or other property.
- For the purposes of the management, conservation, protection or control of wildlife or for the purposes of education about wildlife, research into wildlife or scientific or other study of wildlife.
- For aboriginal cultural purposes.
- For the purposes of enabling the care, treatment or rehabilitation of sick, injured or orphaned wildlife.
- For the purposes of ensuring the health or safety of any person or class of persons.
- To support a recognised wildlife management plan.
- To make provision for the custody, care and management of wildlife, held under another authorisation or a licence which has been suspended, during the period of that suspension.

Under the *Wildlife Act 1975* land can also be designated as State Game Reserves, State Game Refuges, State Faunal Reserves, Game Management Stations, or other classifications as specified, for the preservation and conservation of wildlife. A plan of management is to be developed as soon as practicable for each reserve once gazetted.

7.6.1 Wildlife Regulations 2002

The objectives of the *Wildlife Regulations 2002* are:

- To make further provision in relation to the licensing system established by section 22 of the Wildlife Act 1975.

- To prescribe fees, offences, royalties and various other matters for the purposes of the Wildlife Act 1975.
- To provide for exemptions from certain provisions of the Wildlife Act 1975.

Under *Wildlife Regulations 2002* a person, unless licensed, permitted or authorised to do so under the Act:

- Must not willfully damage, disturb or destroy any wildlife habitat.
- Must not use a bait, lure, poison, decoy, or live animal to attract wildlife for the purpose of taking that wildlife.
- Must not use a firearm from an aircraft, motor vehicle, boat, or any other vehicle to take wildlife.
- Must not use an artificial light, electronic device, or recorded sound to hunt or take wildlife.
- Must not use a gun, bow or other weapon, trap, or any other equipment or substance for the purpose of taking wildlife.

Authorisation to conduct wildlife research or wildlife management can be obtained under the Act, and is subject to any conditions, limitations or restrictions placed on that authorisation. Proponents must allow inspection by an authorised officer, at any reasonable time, for the purpose of monitoring compliance with this Act.

7.7 Water Act 1989

The *Water Act 1989* provides the framework for allocating surfacewater and groundwater throughout Victoria. The Act allows authorities and individuals, via various entitlement mechanisms, to use water for commercial or irrigation purposes. Some licences enable withdrawals of water directly from streams, others from groundwater. The *Water Act 1989* also defines water that is set aside for the environment under the Environmental Water Reserve.

The purpose of the Act is to integrated management of all elements of the terrestrial phase of the water cycle. This includes promotion of orderly, equitable and efficient water use, greater community involvement, integration of surface and subsurface flow management, to promote conservation and environmental enhancement and provide for the protection of catchment conditions.

7.8 Environment Protection Act 1970: State Environmental Protection Policy (Waters of Victoria) 2003

State Environment Protection Policies (SEPPs) express, in law, the Victorian community's expectations, needs and priorities for protecting and sustainably using the environment, and the social and economic values that depend on it. Made under the *Environment Protection Act 1970*, SEPPs are a means of setting agreed outcomes against which we can measure progress and coordinate environment protection throughout Victoria.

The SEPP Waters of Victoria then sets the framework for government agencies, businesses and the community to work together, to protect and rehabilitate Victoria's surface water environments. The Waters of Victoria SEPP details the uses and values of our water environments (beneficial uses), sets measurements and indicators so we know how well they are being protected (environmental quality objectives) and outlines what needs to be done to protect them (attainment program).

The result is a 'blueprint' for achieving agreed environmental outcomes and strategic directions for protecting Victoria's water. More detailed management frameworks and tools are provided through statewide strategies (e.g. the Victorian River Health Strategy) and more detailed actions are provided in regional plans developed by catchment, coastal and water management bodies.

The *Environment Protection Act 1970* also adopts as a principle tenet the Precautionary Principle where, in the threat of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.

7.9 Port Phillip and Western Port Regional Catchment Strategy

A primary function of the Port Phillip and Westernport Catchment Management Authority is to prepare a catchment management strategy for its region and coordinate and monitor its implementation. The *Port Phillip and Western Port Regional Catchment Strategy* describes the natural assets of the region, how these are interrelated, and provides a management framework for their conservation and sustainable use. The *Regional Catchment Strategy* focuses on four main groups of catchment assets – water resources (sustainable water use and healthy waterways), land (appropriate land management and sustainable productivity), biodiversity (healthy, diverse and enduring ecosystems) and the people of the region (community participation working to achieve sustainability).

The *Regional Catchment Strategy* is an important planning and working document for all organisations and people involved in natural resource management in the region, including government agencies and councils, water authorities and Landcare and community groups. It provides a framework for effort, an investment guide, a means of integrating policy, and an action plan for catchment works. It allocates tasks and defines roles for many

stakeholders in the delivery of environmental programs across the region. It is also a regional investment guide, informing the allocation of Victorian and Australian Government investment in natural resource management in the region.

7.10 Port Phillip and Western Port Regional River Health Strategy

The *Port Phillip and Westernport Regional River Health Strategy* was developed by Melbourne Water in consultation with the Port Phillip and Westernport Catchment Management Authority, their local community and key stakeholders. The *River Health Strategy* provides a five year blueprint for the stakeholders to work together to improve our rivers and creeks. It identifies waterway values (catchment based), threats to waterway values, and actions to address these threats. The Strategy identifies river health related objectives, activities and targets for rivers located within the Maribyrnong, Werribee, Bunyip and Yarra river basins.

The *Port Phillip and Westernport Regional River Health Strategy* also covers drainages within the Westernport, Werribee and Maribyrnong catchments which, until now, had no designated regional management authority. Under the new arrangements, Melbourne Water is now the regional drainage, waterways and floodplain manager for the entire region, and is responsible for river health, management and maintenance of regional drains as well as identifying and maintaining areas subject to flooding. This arrangement will also provide more consistent and coordinated delivery of waterway health and improvement programs.

7.11 Local Government Planning Schemes

Local Government Planning Schemes set out policies and provisions for the use, development and protection of land for municipalities in Victoria. These are legal documents prepared by the local council or the Minister for Planning, and approved by the Minister.

The development of the Planning Schemes is based on a comprehensive set of planning provisions for Victoria outlined in the Victorian Planning Provisions (VPPs). VPPs were introduced as part of a planning reform process in 1996 to simplify and standardise the planning process.

Provision 52.17 of the VPP outlines objectives for the protection and conservation of native vegetation. The purpose of 52.17 is to protect and conserve native vegetation, to reduce the impact of land and water degradation and provide habitat for plants and animals, to avoid, minimise or Offset vegetation loss, and to manage vegetation near buildings to reduce the threat to life and property from wildfire.

Before deciding on an application, in addition to the decision guidelines in Clause 65, the responsible authority must consider, as appropriate:

- Victoria's Native Vegetation Management – A Framework for Action (DNRE 2002).
- Whether the proposed development can be located and designed to avoid the removal of native vegetation.
- Whether the proposed development is located and designed to minimise the removal of native vegetation.
- The need to offset the loss of native vegetation having regard to the conservation significance of the vegetation.
- The conservation and enhancement of the area.
- The preservation of and impact on the natural environment or landscape values.
- Any relevant approved Regional Vegetation Plan.
- Whether the proposed development is in accordance with any property vegetation plan that applies to the site.
- The cumulative impact of native vegetation removal on biodiversity conservation and management.

Exemptions apply in certain circumstances, as outlined in Clause 52.17-6, Table of exemptions.

7.12 Catchment and Land Protection Act 1994

The *Catchment and Land Protection Act 1994* (CaLP Act 1994) contains provisions relating to the integrated management and protection of catchments, encourages community participation in the management of land and water resources, and sets up a system of controls for the management of noxious weeds and pest animals. This Act also provides a legislative framework for the integrated and coordinated management of private and public land at a catchment level which:

- Focuses on long-term land productivity while also conserving the environment.
- Ensures that the quality of the State's land and water resources and their associated plant and animal life are maintained and enhanced.
- Establishes processes that can be used to assess the condition of the State's land and water resources and the effectiveness of land protection measures.
- Establish processes to encourage and support participation of land holders, resource managers and other members of the community in catchment management and land protection.

- Establishes and supports the operation of the Victorian Catchment Management Council and the Catchment Management Authorities.

- To provide for the control of noxious weeds and pest animals.

The study site supports a number of weeds that are declared noxious under the CaLP Act 1994. Plants occurring on this list are known, or have the potential to, result in detrimental environmental or economic impact.

Under the CaLP Act 1994 declared noxious weeds are categorised into four groups depending on their known and potential impact and specific circumstances for each region. These categories include:

- State Prohibited Weeds (S) are either currently absent in Victoria or are restricted enough to be eradicated. The Victorian Government is responsible for their control.

- Regionally Prohibited Weeds (P) in the Port Phillip Catchment Management Authority area are not necessarily widespread but have the potential to become widespread. It is expected that weeds that meet this criteria can be eradicated from the region. For weeds considered to be Regionally Prohibited it is the responsibility of the land owner to control these weeds on their land but not on adjacent roadside reserves.

- Regionally Controlled Weeds (C) are usually widespread but it is important to prevent further spread. It is the responsibility of the landowner to control these weeds on their property and on adjacent roadside reserves.

- Restricted occur in other states and are considered to be a serious threat to primary production, Crown land, the environment and/or community health if they were traded in Victoria. No weeds are currently listed as Restricted Weeds.

The study area may support regionally controlled noxious weeds listed by DPI (2006). The control of these weeds on private land and adjacent roadsides is the responsibility of the landholder. The landholder must take all reasonable measures to prevent their spread and control these weed species.

8. FLORA CONCLUSION

Native vegetation within the Cranbourne North (Stage 2) Precinct occurs as scattered patches confined primarily to farm dams, roadsides and within paddocks and drainage-lines. Habitat Zones within the study area include:

- Tall Marsh within farm dams in the north of the site
- a Swampy Woodland remnant within the Clyde road roadside reserve
- one small patch of Swamp Scrub
- tree-less Plains Grassy Woodland comprising regenerating indigenous herbs and grasses within paddocks in the south-east of the study area

In addition, there are areas of native (non-indigenous) and exotic (introduced) vegetation, including areas of regenerating Swamp Scrub that do not meet the DNRE (2002) threshold for consideration under Victoria's *Native Vegetation Management Framework*. Many of these sites, whilst highly modified or immature, comprise relatively complex vegetation structures and floristic diversity and are considered habitat for threatened fauna species (Part 2 Figure 3).

Non-indigenous habitat comprises planted Eucalypts and other established tree species along fence-lines and roadsides, as well as established trees within gardens and plantation areas (Part 2 Figure 3). In addition, some drainage lines and roadsides are dominated by exotic vegetation and woody weed thickets which offer habitat for ground fauna. Areas dominated by grassy weed and drainage lines vegetated with semi-aquatic exotics (in particular Drain Flat-sedge **Cyperus eragrostis*) also offer modified habitat for threatened wetland birds and amphibians (Part 2 Figure 3).

The remainder of the study area comprises large areas of agricultural land with little or no native vegetation cover.

It is estimated that about 7% of former native vegetation remains within the City of Casey, of which a significant proportion has been highly modified (McMillan et al. 2003). Patterns of vegetation clearance within the study area are consistent with those undertaken historically throughout the City of Casey, whereby, the majority of the study area has been cleared for agriculture and remaining native vegetation has been modified to varying degrees. All remnant vegetation and all remaining habitat, both indigenous and non-indigenous, is therefore significant as a local source of biodiversity.

Roadsides within the City of Casey are often the only remaining indigenous habitat within an area and are critically important as habitat corridors for fauna throughout the municipality (Lane 2008). Native vegetation distribution within the study area is consistent with general patterns of vegetation distribution within the City of Casey, in that roadsides comprise greater biodiversity compared to surrounding agricultural land.

Large trees containing hollows and canopy habitat are common as planted exotic and non-indigenous Eucalypts along fence-lines and roadsides. Established trees, especially Eucalypts are particularly valuable as habitat for threatened woodland birds.

Farm dams and wetland vegetation within the study area are particularly important areas of faunal habitat, including habitat for threatened wetland birds.

At least one threatened flora species; River Swamp Wallaby-grass is considered to have a moderate likelihood of occurrence within the study area.

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Flora Appendix 1. Flora Species recorded on databases

Flora species detected within a five kilometre radius from the study area boundary on DSE's *Flora Information System* (DSE 2009d). Relevant species listed on EPBC Protected Matters Search Tool (DEWHA 2009a) also included.

Likelihood of Occurrence:
Low: Few aspects of habitat requirements are met on site.
Moderate: Some aspects of habitat requirements are met on site.
High: Optimal habitat present.

Conservation Status Codes (EPBC and FFG Acts):

EN – Endangered under the National EPBC Act (very high risk of extinction in the wild)

VU – Vulnerable under the National EPBC Act (high risk of extinction in the wild)

f-Listed as threatened under the Flora and Fauna Guarantee Act

Victorian Conservation Status Codes(DSE 2005a):
e - Endangered (at risk of becoming extinct);
v - Vulnerable (at risk of becoming endangered);
r -Rare (rare but not considered otherwise threatened);
k -poorly known (accurate distribution information is inadequate to allocate to one of the conservation status categories);

FFG	EPBC	DSE	Common Name	Scientific Name	Family Name	Likelihood of Occurrence	Database	Freq (FIS only)	NumSite (FIS only)	Likelihood Reasoning	Habitat
	VU		River Swamp Wallaby-grass	*Amphibromus fluitans*	Poaceae	Med	FIS/EPBC	0.37%	1	Last rec from 1990. Possible due to farm dams within the study area	Mostly confined to the north-central Victorian reach of the Murray River and is uncommon in southern Victoria. Occurs in natural and constructed wetlands such as farm dams, lagoons and swamp margins (DEWHA 2009b; Walsh & Entwistle 1994).
		r	Veined Spear-grass	*Austrostipa rudis subsp. australis*	Poaceae	Low	FIS	0.37%	1	Unlikely	Dry open forest, grassy low open forest on sandy soils. Uncommon with scattered populations across southern Victoria.(Walsh & Entwistle 1994)
		r	Orange-tip Finger-orchid	*Caladenia aurantiaca*	Orchidaceae	Low	FIS	0.37%	1	Unlikely, rec from 1971. Most recent rec from RBGC	Southern Victoria, east of Melbourne in open forests, heathlands and heathy woodlands.(Walsh & Entwistle 1999)
	EN		Cream Spider-orchid	*Caladenia fragrantissima subsp. orientalis*	Orchidaceae	Low	EPBC			nearest rec south Gippsland	Populations limited to a small area of coastal far western Victoria and Southern Gippsland. Found in coastal heathlands and heathy woodlands on sandy soils(Walsh & Entwistle 1994)
		v	Wine-lipped Spider-orchid	*Caladenia oenochila*	Orchidaceae	Low	FIS	0.37%	1	unlikely - rec from 1939, north of bypass	Uncommon populations across southern Victoria. Occurs in Foothill and heathy Forests in low hill areas.(Jeanes and Backhouse 2006)
		v	Annual Bitter-cress	*Cardamine paucijuga s.s.*	Brassicaceae	Low	FIS	0.37%	1	Unlikely - limited habitat present	Scattered populations, primarily in southern Victoria including Portland, Grampians and Wilsons Promontory (Walsh & Entwistle 1996). Occurs in riparian and swamp scrub in rich soil in dry or moist conditions.(Australian Plants Society 2001)
		k	Slender Bitter-cress	*Cardamine tenuifolia*	Brassicaceae	Low	FIS	0.37%	1	Unlikely - limited habitat present	Swamp margins, plains grassland, valley sclerophyll forest in populations scattered across southern Victoria. (Walsh & Entwistle 1996)
f		e	Grey Billy-buttons	*Craspedia canens*	Asteraceae	Low	FIS	1.11%	3	Unlikely - 3 recs from intact wetland north of Cranbourne	Few populations in south-east Victoria between Cranbourne and Traralgon. Grasslands, often around margins of swamps.(Walsh & Entwistle 1999)
	EN	e	Matted Flax-lily	*Dianella amoena*	Liliaceae	Low	EPBC			Nearest records on old Clyde rail corridor and grasslands east of Cardinia Creek - could be present in remnants	Confined to southern Victoria in vegetation types such as lowland grasslands, grassy woodlands and grassy wetlands. The species can tolerate well drained to seasonally wet soils (DEWHA 2009c).
f		v	Purple Diuris	*Diuris punctata var. punctata*	Orchidaceae	Low	FIS	2.60%	7	Recs from early 1980's, but may still be present in grassland remnants	Distributed widely across lowland areas of Victoria. Occurs in grassy and heathy vegetation types such as lowland native grasslands, grassy woodlands, heathy woodlands and open heath-lands, usually on fertile, loamy soils. The species can tolerate periodic inundation (DSE 2004b).
		k	Grey Spike-sedge	*Eleocharis macbarronii*	Cyperaceae	Low	FIS	0.37%	1	Unlikely	Infrequent populations in areas of western and northern Victoria. Found in heavy soils in waterlogged areas around wetlands and drainage lines.(Walsh & Entwistle 1994)

FFG	EPBC	DSE	Common Name	Scientific Name	Family Name	Likelihood of Occurrence	Database	Freq (FIS only)	NumSite (FIS only)	Likelihood Reasoning	Habitat
		r	Green Scentbark	*Eucalyptus fulgens*	Myrtaceae	Low	FIS	0.74%	2	All recs from shf bioregion, occasional plants on the plains	Open forest areas, tolerating damp conditions. Found in areas east of Healesville and Woori Yallock to the Latrobe Valley. (Walsh & Entwistle 1994)
		v	Pale Swamp Everlasting	*Helichrysum aff. rutidolepis (Lowland Swamps)*	Asteraceae	Low	FIS	0.74%	2	Unlikely - recs from intact wetland at Lynbrook and Clyde rail corridor	Moist well drained sites in open grassy forest or woodland. Frequent, widespread populations across much of Victoria, excluding the north-west.(Walsh & Entwistle 1999)
f		r	Purple Blown-grass	*Lachnagrostis punicea subsp. filifolia*	Poaceae	Low	FIS	1.11%	3	Unlikely - recs from intact wetland at Lynbrook	Scattered populations across the Victorian Volcanic plains in wet depressions, marshes and slightly saline swamps.
		v	Plains Yam-daisy	*Microseris sp. 1*	Asteraceae	Low	FIS	0.37%	1	Unlikely - recs from remnant near Lynbrook	Rare in Plains Grassland and Woodlands in damp depressions in the Basalt soils of Victorias Western Plains.(Walsh & Entwistle 1999)
		k	Perfoliate Pondweed	*Potamogeton perfoliatus s.l.*	Potamogetonaceae	Low	FIS	0.37%	1	Unlikely - nearest recs from Cardinia Creek	Flowing or still, fresh or brackish, creeks and rivers. On Sandy, stoney or muddy substrates.(Walsh & Entwistle 1994)
f	EN	e	Maroon Leek-orchid	*Prasophyllum frenchii*	Orchidaceae	Low	FIS/EPBC	1.85%	5	Recent records (within the last 20 years) >5km away in Clyde railway	Infrequent, widespread populations in south western Victoria. Grasslands heathlands and grassy woodlands on moist well drained soils, including roadsides or rail reserves .(Jeanes and Backhouse 2006)
		e	Silurian Leek-orchid	*Prasophyllum pyriforme s.s.*	Orchidaceae	Low	FIS	0.37%	1	last rec from 1932	Few known populations, occurring to the north-east of Melbourne in dry open forest with shrubby understory.(Jeanes and Backhouse 2006)
		r	Cobra Greenhood	*Pterostylis grandiflora*	Orchidaceae	Low	FIS	0.37%	1	last rec from 1940	Few widely distributed populations in Eastern Victoria. Moist shady slopes in heath and grassy open forests. (Jeanes and Backhouse 2006)
		r	Sharp Greenhood	*Pterostylis X ingens*	Orchidaceae	Low	FIS	0.37%	1	last rec from likely 1940s	Infrequent, widespread colonies across Victoria. Occurring in areas of moist open forest.(Walsh & Entwistle 1994)
		r	Long Pink-bells	*Tetratheca stenocarpa*	Elaeocarpaceae	Low	FIS	0.37%	1	last rec 1935	Tall open forest areas with populations limited to the Healesville area, the Pyrete Ranges and French Island.(Walsh & Entwistle 1999)
	EN		Metallic Sun-orchid	*Thelymitra epipactoides*	Orchidaceae	Low	EPBC			Nearest rec near Dandenong in 1980, nearest recent rec in West Gippsland	Uncommon small colonies in areas of southern Victoria, particularly near the coast (Walsh & Entwistle 1999). Greatly reduced populations due to decline in suitable habitat. Grows in coastal heathlands, grasslands and woodlands and in swampy depressions.(Jeanes and Backhouse 2006)
f	VU	v	Swamp Everlasting	*Xerochrysum palustre*	Asteraceae	Low	FIS/EPBC	0.37%	1	nearest rec in Lynbrook	Occurs in swamps usually found on basalt derived soils

Flora Appendix 2. Habitat Hectare Results

Precinct			16	16	16	16	16	16	16	16	16	16	16
PFI			2023469	2023469	2023469	2023470	603236	603298	2023469	2023470	R536834	206233621	206233621
Site ID			1	2	2	1	1	1	3	2	1	1	2
Habitat Zone			A	A	B	A	A	A	A	A	A	A	A
EVC Name (Initials)			PGW	PGW	PGW	PGW	SS	SWO	SWO	SWO	SWO	TM	TM
EVC Number			GipP0055	GipP0055	GipP0055	GipP0055	GipP0053	GipP0937	GipP0937	GipP0937	GipP0937	GipP0821	GipP0821
Total Area of Habitat Zone (ha)		**(#.#)**	0.02	0.33	0.15	0.01	0.05	0.03	0.12	0.02	0.09	0.21	0.42
		Max Score	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**	**Score**
Site Condition	**Large Old Trees**	**10**	0	0	0	0	0	0	0	0	0	0	0
	Canopy Cover	**5**	0	0	0	0	4	0	0	0	0	0	0
	Lack of Weeds	**15**	0	0	2	2	0	0	0	0	0	0	7
	Understorey	**25**	5	5	5	5	0	5	5	5	5	15	5
	Recruitment	**10**	0	0	0	0	0	3	3	3	3	3	3
	Organic Matter	**5**	4	4	4	4	5	5	5	5	5	5	5
	Logs	**5**	0	0	0	0	0	0	0	0	0	0	0
	Total Score	**75**	**9**	**9**	**11**	**11**	**9**	**13**	**13**	**13**	**13**	**31.28**	**27.2**
Landscape Score		**25**	5	5	5	5	0	1	1	1	1	1	1
Habitat Score#		**100**	14	14	16	16	9	14	14	14	14	32	28
Habitat Score as above = #/100		**0.##**	0.14	0.14	0.16	0.16	0.09	0.14	0.14	0.14	0.14	0.32	0.28
Habitat Hectares		**(#.#)**	**0.0028**	**0.0462**	**0.024**	**0.0016**	**0.0045**	**0.0042**	**0.0168**	**0.0028**	**0.0126**	**0.0672**	**0.1176**
Bioregion			GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP	GipP
EVC Conservation Status			E	E	E	E	E	E	E	E	E	E	E
Conservation Significance	**Conservation Status x Habitat Score**		High	High	High	High	High	High	High	High	High	High	High
	Threatened Species Rating		High	High	High	High	Very High	Very High	Very High	Very High	Very High	Very High	Very High
	Other Site Attribute Rating												
	Overall Conservation Significance (highest rating)		**High**	**High**	**High**	**High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**	**Very High**
Threatened Species Rating	**Presence of threatened/rare flora species.** **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat											River Swamp Wallaby-grass	River Swamp Wallaby-grass
	Status (highest status of likely spp.)											Vulnerable	Vulnerable
	Presence of threatened/rare fauna species. **Bold Text:** Best 50% of habitat Standard Text: Remaining 50% of habitat						**Southern Toadlet, Swamp Skink, Glossy Grass Skink,**	**Southern Toadlet, Swamp Skink, Glossy Grass Skink,**	**Southern Toadlet, Swamp Skink, Glossy**	**Southern Toadlet, Swamp Skink, Glossy Grass Skink,**	**Southern Toadlet, Swamp Skink, Glossy Grass Skink,**	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Australian Shoveler, Baillon's Crake, Eastern Great Egret, Blue-billed Duck, Freckled Duck, Hardhead, Intermediate Egret, Lantham's Snipe, Musk Duck, Pied Cormorant, Royal Spoonbill,** Growling Grass Frog	**Southern Toadlet, Glossy Grass Skink, Swamp Skink, Eastern Great Egret, Intermediate Egret, Australian Shoveler, , Hardhead**, Baillon's Crake Lantham's Snipe, Pied Cormorant, Royal Spoonbill, Growling Grass Frog
	Status (highest status of likely spp.)						Vulnerable	Vulnerable	Vulnerable	Vulnerable	Vulnerable	Critically Endangered	Critically Endangered

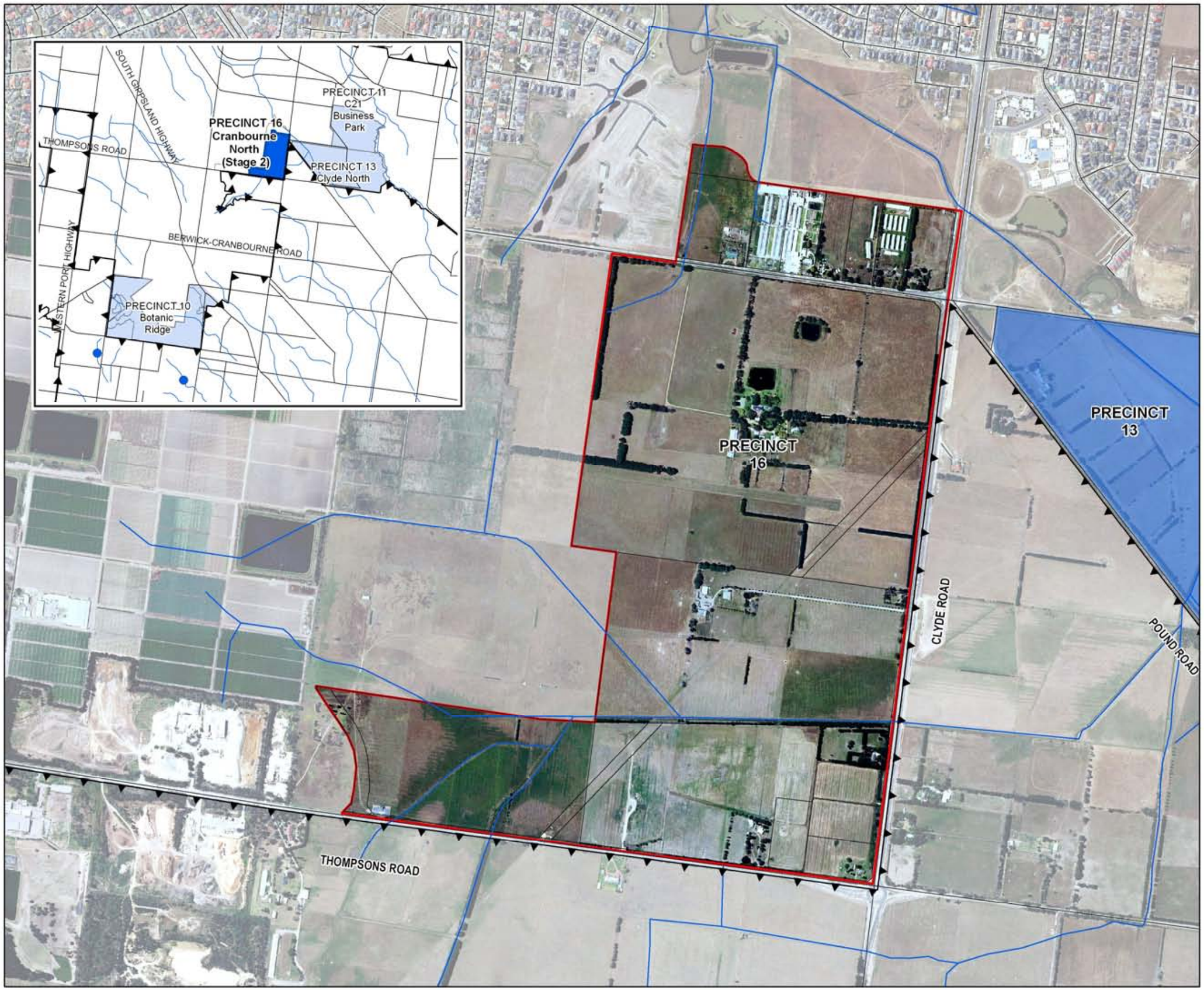
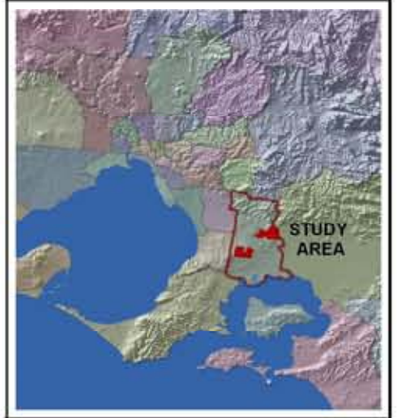


FIGURE 1
Context Map of PSP Areas
Biodiversity Assessment Report
Flora Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Urban Growth Boundary
- Property Boundary
- Precinct Boundary



MAP AND SURVEY DETAILS
Mapping by: Staci Timms, May '09
Generated from: GIS layers and Aerial Photography, supplied by DSE, GAA, ESRI and Geosciences Australia.

DATUM: GDA 94 MGA Zone 55

N

NOTES:
Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

VERSION	03	DATE	29/04/10

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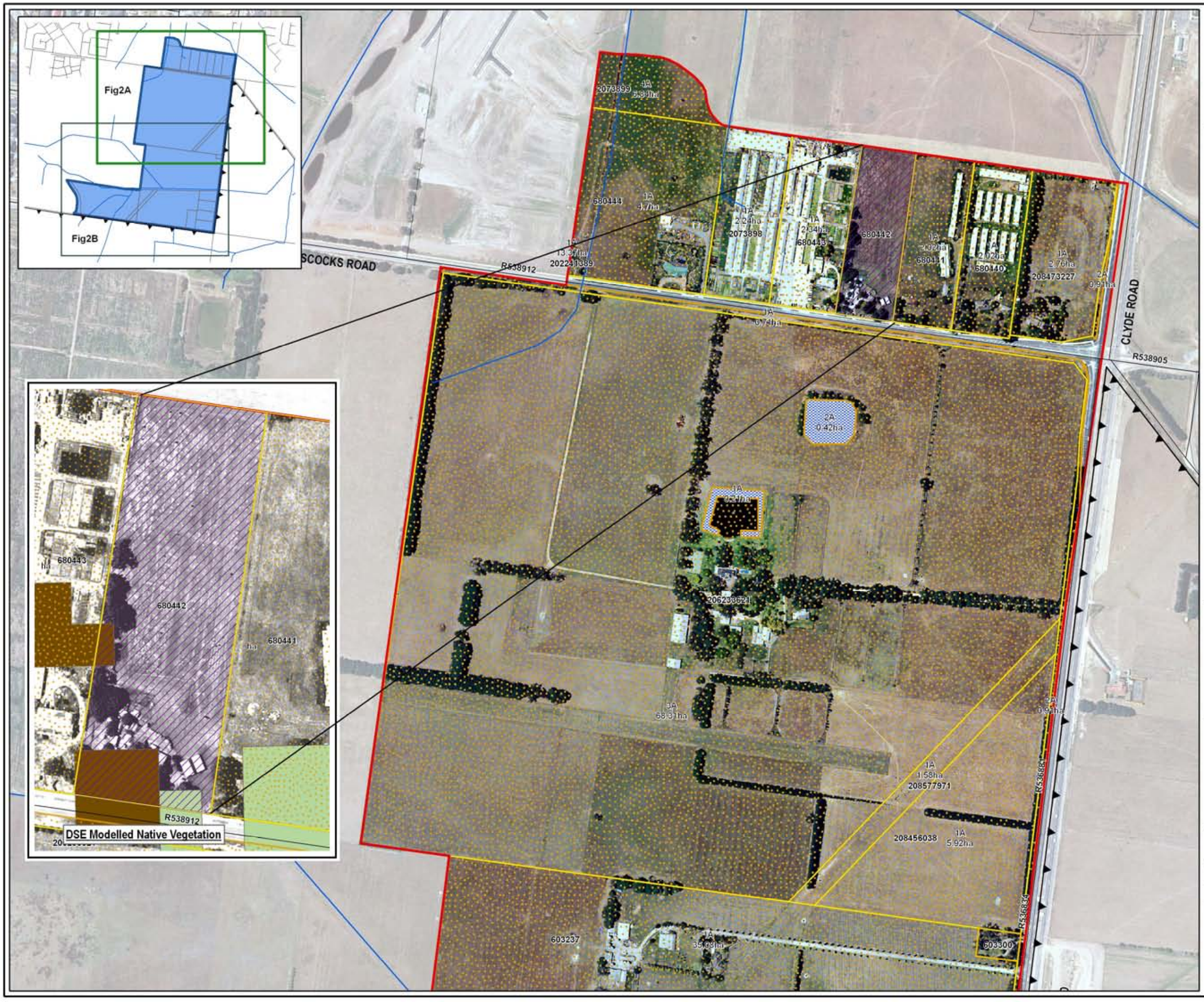

FIGURE 2A
Native Vegetation Within Precinct 16 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Degraded Treeless Vegetation

Habitat Zone EVCs

- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 821: Tall Marsh
- EVC 937: Swampy Woodland

"Drive By" and DSE Modelled Native Vegetation Assessments

- Highly Likely Native Vegetation - Woody
- No Native Vegetation

Property Assessment Status

- Property Not Assessed
- Access to Property Denied

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250

Metres
1:5,000

NOTES:
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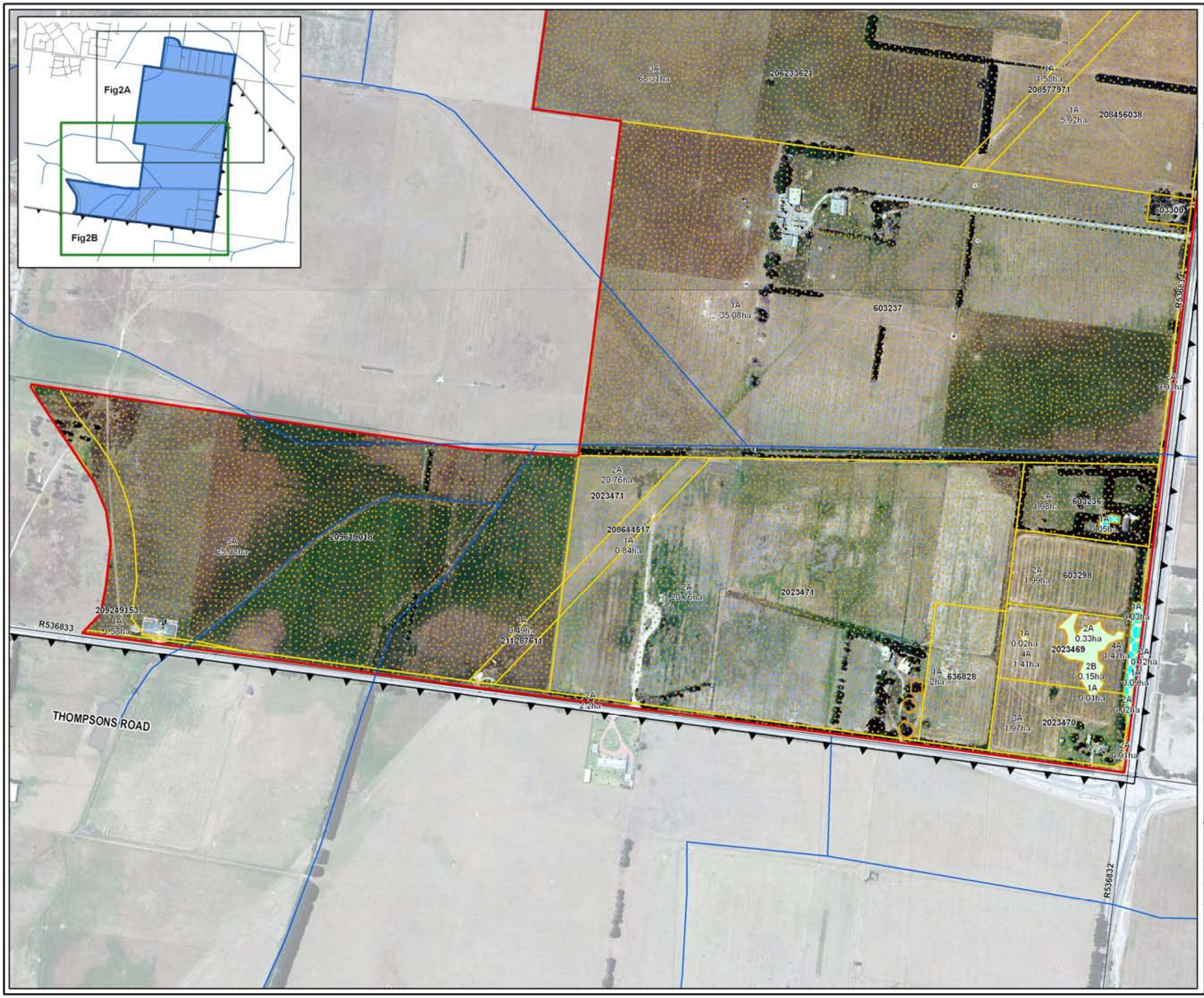

FIGURE 2B
Native Vegetation Within Precinct 16 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Degraded Treeless Vegetation

Habitat Zone EVCs

- EVC 53: Swamp Scrub
- EVC 55: Plains Grassy Woodland
- EVC 821: Tall Marsh
- EVC 937: Swampy Woodland

"Drive By" and DSE Modelled Native Vegetation Assessments

- Highly Likely Native Vegetation - Woody
- No Native Vegetation

Property Assessment Status

- Property Not Assessed
- Access to Property Denied

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge. Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

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N

0 50 100 150 200 250

Metres
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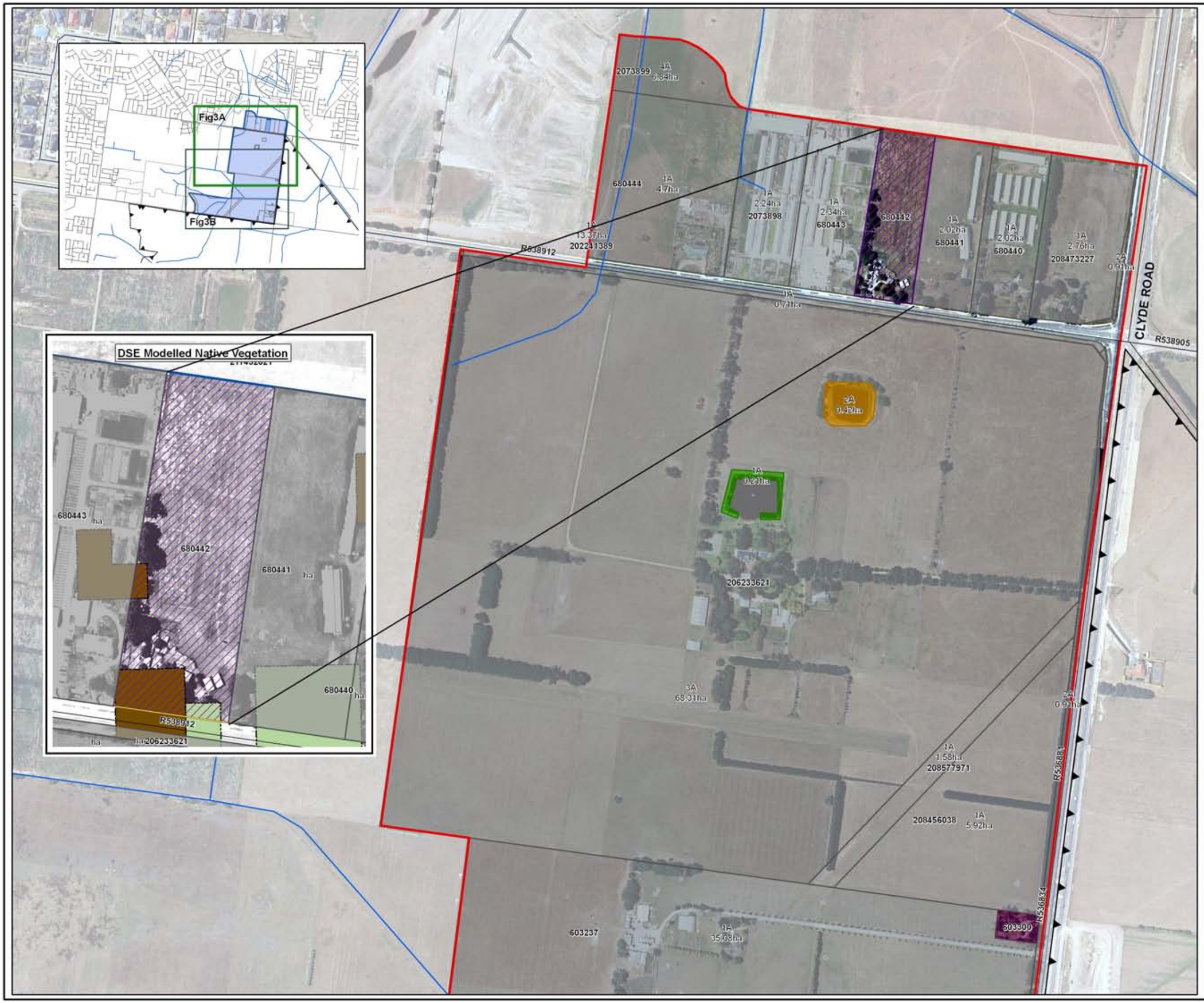

FIGURE 3A
Vegetation Quality of Habitat Zones Within Precinct 16 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary

Property Assessment Status

- Property Not Assessed
- Access to Property Denied

"Drive By" and DSE Modelled Native Vegetation Assessments

- Highly Likely Native Vegetation - Woody
- No Native Vegetation

Vegetation Quality of Habitat Zones

Site Condition Scores

- 0
- 1 - 19.99
- 20 - 29.99
- 30 - 100

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge. Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250
Metres

1:5,000

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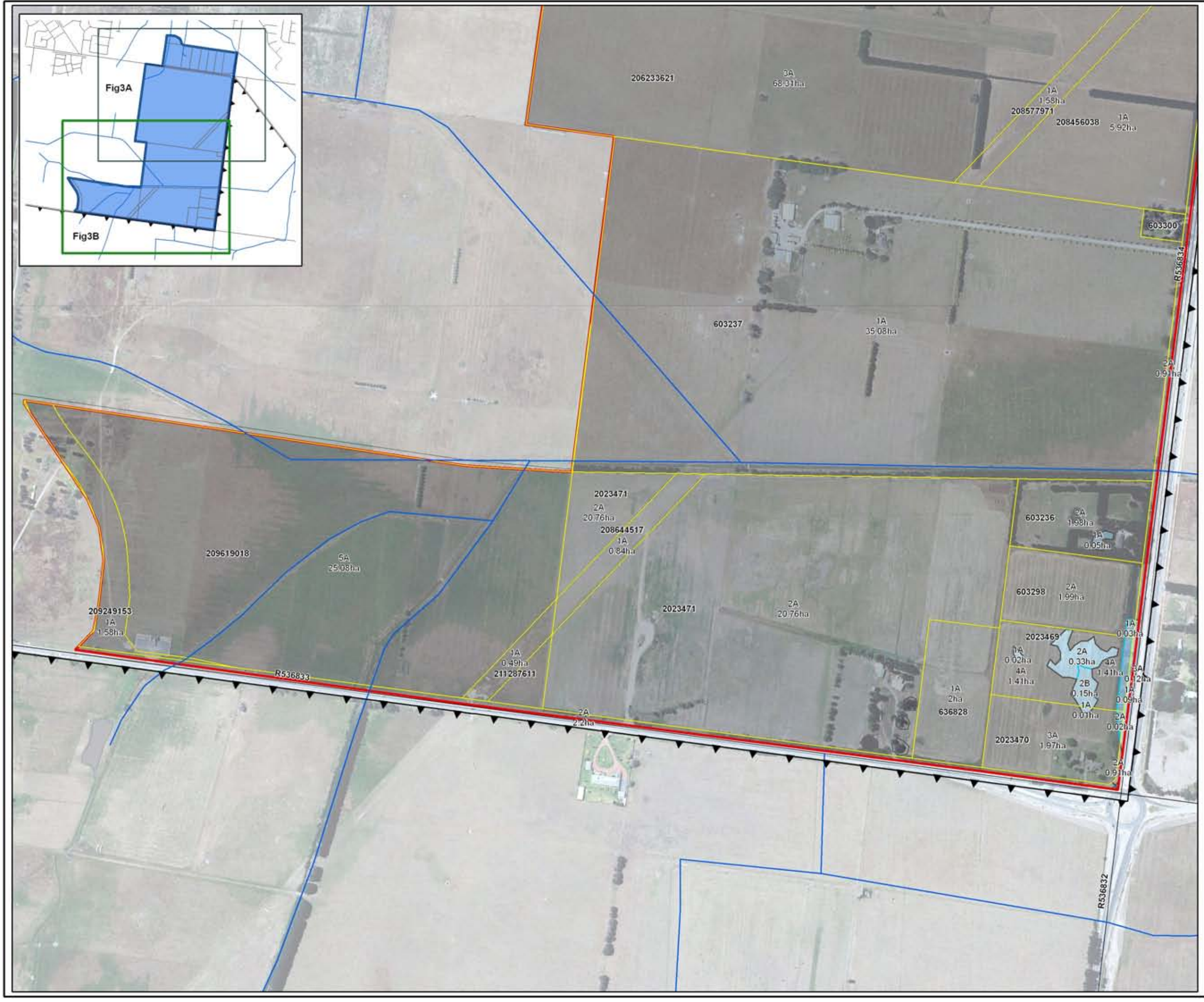

FIGURE 3B
Vegetation Quality of Habitat Zones Within Precinct 16 Study Area

Biodiversity Assessment Report
Flora Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary

Property Assessment Status

- Property Not Assessed
- Access to Property Denied

"Drive By" and DSE Modelled Native Vegetation Assessments

- Highly Likely Native Vegetation - Woody
- No Native Vegetation

Vegetation Quality of Habitat Zones

Site Condition Scores

- 0
- 1 - 19.99
- 20 - 29.99
- 30 - 100

MAP AND SURVEY DETAILS

Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge. Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250
Metres

1:5,000

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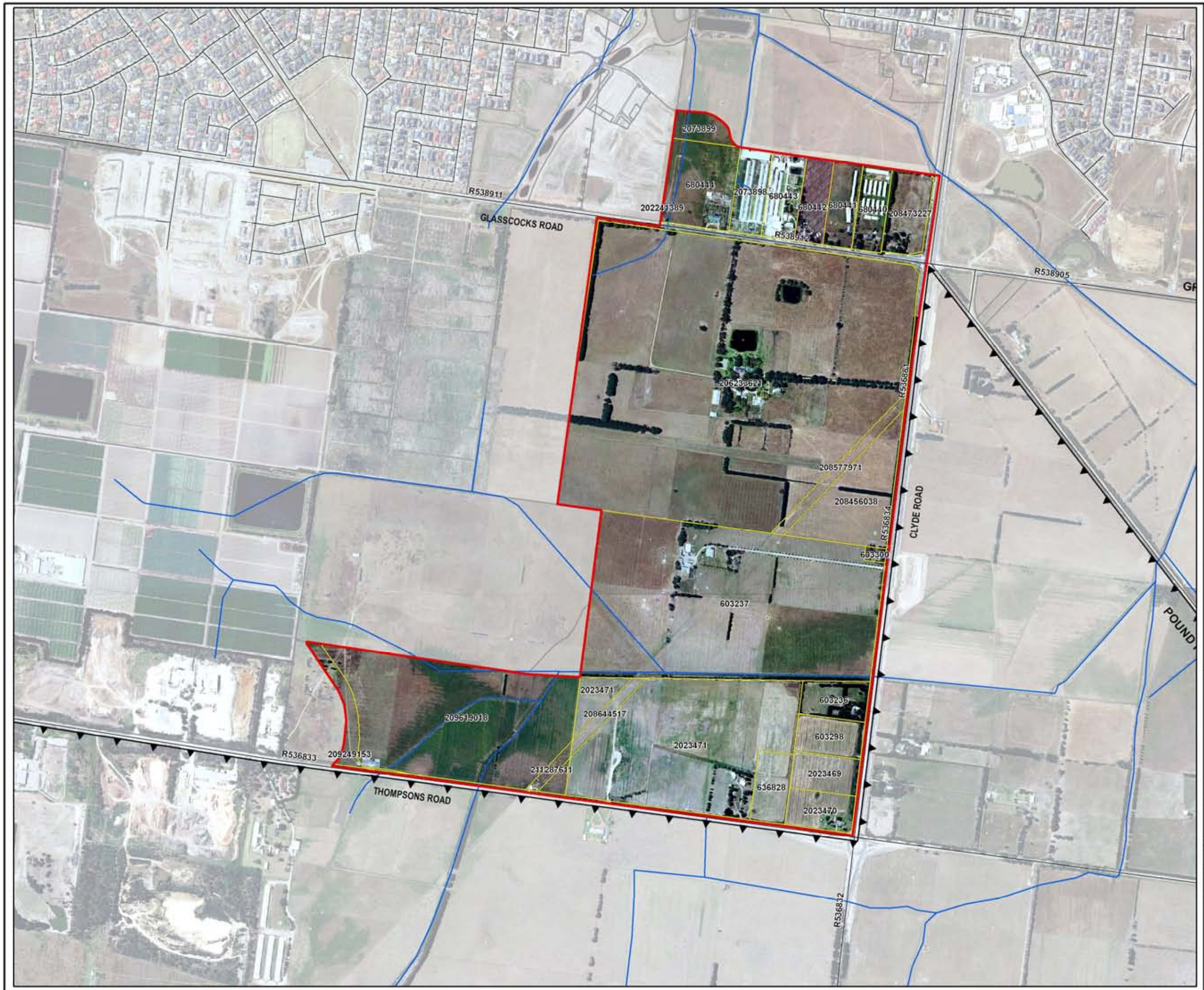

FIGURE 4
Significant Species Distribution
Precinct 16 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Study Area Boundary
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary

Property Assessment Status

- Property Not Assessed
- Access to Property Denied
- 633479 Parcel PFI
- R539084 Road PFI
- *Thelymitra circumsepta* (1998) State Significant Species and Date of Record
- *Diuris amoena* (2004) Nationally Significant Species and Date of Record

Significant Flora Species

- Database Records of Species of National Significance
- Database Records of Species of State Significance
- Surveyed Records of Species of National Significance
- Surveyed Records of Species of State Significance

MAP AND SURVEY DETAILS
Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
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DATUM: GDA 94 MGA Zone 55

N

0 100 200 300 400 500
Metres

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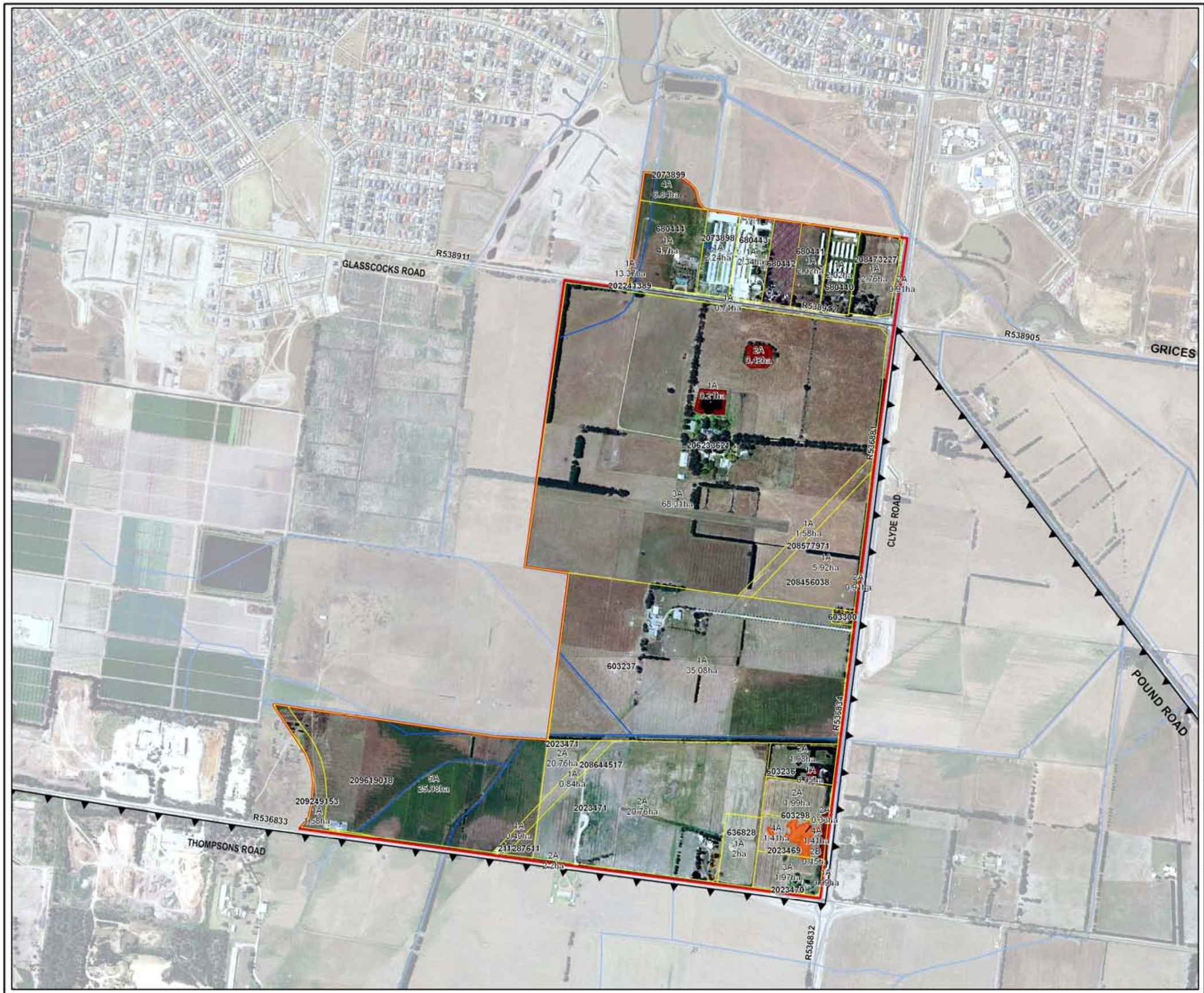

FIGURE 5
Conservation Significance
Precinct 16 Study Area
Biodiversity Assessment Report
Flora Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- 633479 Parcel PFI
- R539084 Road PFI
- Degraded Treeless Vegetation

Property Assessment Status

- Property Not Assessed
- Access to Property Denied

Conservation Significance

- Very High
- High
- Medium
- Low

MAP AND SURVEY DETAILS

Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 100 200 300 400 500
Metres

1:10,000

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Part 3

Targeted Fauna Survey

Precinct Structure Plan Area 16;

Cranbourne North (Stage 2)

10. FAUNA INTRODUCTION

Practical Ecology Pty Ltd was commissioned by Growth Areas Authority to undertake a targeted fauna survey and fauna habitat assessment of Precinct Structure Plan are 16; *Cranbourne North (Stage 2)*, referred to hereafter as *Precinct 16*, in Cranbourne North, Victoria. The primary objectives of this study are to establish the distribution, abundance and significance of fauna and fauna habitats within the study area and to present the information within the context of relevant legislation and policy.

This report provides information on the fauna and fauna habitat within Precinct 16 by:

- establishing the study area's known biological values with regard to fauna
- documenting significant fauna species that occur or have potential to occur within the study area
- assessing all fieldwork data and information from relevant literature and databases against relevant policy and legislation

11. FAUNA METHODS

Fauna taxonomy is consistent with the Victorian Wildlife Atlas database (also called Victorian Fauna Database (VFD), when accessed through Viridans software (DSE 2007a).

11.1.1 Existing Information

Previous studies including Costello et al. (2001), Fairbridge & Appleby (2009) and McMillan et al. (2003) were reviewed. Existing information on the DSE's Victorian Fauna Database (VFD) July 2005 edition for a five kilometre radius around the study area was retrieved. In addition, a report was generated from the Department of Environment, Water Heritage and the Act's (DEWHA) *Protected Matters Search Tool* for a five kilometre radius from the study area boundary (DEWHA 2009). The *Protected Matters Search Tool* uses habitat modelling to predict the presence of nationally significant species within five kilometres of the study area.

11.1.2 New Information

The study area, excluding private properties to which access was denied, was surveyed by Malcolm Legg of Mal's Environmental and Ecological Services between 20 March and 17 May 2009 (Figure 2). Targeted searches were undertaken for seven state or nationally significant species (Table 3).

Table 2. Threatened Species Targeted for Fauna Survey

FFG	EPBC	DSE (2007)	Common name	Scientific name
L	VU	v	Australian Grayling	*Prototroctes maraena*
L	VU	v	Dwarf Galaxias	*Galaxiella pusilla*
		n	Glossy Grass Skink	*Pseudemoia rawlinsoni*
L	VU	e	Growling Grass Frog	*Litoria raniformis*
I	EN	n	Southern Brown Bandicoot	*Isoodon obesulus obesulus*
		v	Southern Toadlet	*Pseudophryne semimarmorata*
L		v	Swamp Skink	*Egernia coventryi*

Australian Grayling and Dwarf Galaxias

Australian Grayling *Prototroctes maraena* and Dwarf Galaxias *Galaxiella pusilla* were targeted using rectangular bait traps baited with White Bait placed in appropriate habitat, near reeds and sedges. Two traps were deployed at each survey location. Traps were checked two-three times before midnight, after which they were left overnight and re-checked again the following morning. Dip-nets were also used near the banks of waterways in and around reeds and sedges in random searches at each survey location.

Glossy Grass Skink

Glossy Grass Skink *Pseudemoia rawlinsoni* was surveyed by using 30cm by 30cm pieces of colour-bond tin placed at 20 meter intervals along six transects, within suitable habitat. Habitat included roadsides, drainage lines and Cardinia Creek. The tin pieces were lifted the following morning prior to 11am and reptiles sheltering under the tin for warmth were caught or observed. Surveys were undertaken in all weather.

Growling Grass Frog

Potential Growling Grass Frog *Litoria raniformis* habitat was identified using aerial photography followed by habitat assessment in the field. Habitat attributes, according to Tyler (1989); Cogger (2000) and Clemann & Gillespie (2004) were assessed, including:

- Wetland type and permanency (ephemeral farm dam, permanent / semi-permanent creek line or quarry lagoon).
- The presence of emergent, submergent and floating vegetation (for male calling platforms, sheltering and tadpole protection)
- The presence of rocks and fallen timber (for basking and sheltering) within and adjacent to potential sites.
- The presence of soil cracking and fringing vegetation (for refuge and foraging).
- Distance of survey sites to the nearest suitable water body. Note; this species is highly mobile and can move up to one kilometre within 24 hours (DEWHA 2009; Clemann & Gillespie 2004).

Some potential Growling Grass Frog habitat was identified within the study area, however, timing and weather constraints prevented Growling Grass Frog survey from being undertaken (see limitations sections 12 and 13.4.2). No targeted survey for Growling Grass Frog was undertaken within Precinct 16. Potential Growling Grass Frog habitat within the study area was identified only in areas outside the current PSP boundary.

Southern Brown Bandicoot

Potential Southern Brown Bandicoot *Isoodon obesulus obesulus* habitat was traversed on foot for signs of Bandicoot diggings and scats. When diggings were located, infra red cameras were deployed for seven days and nights during the full or new moon cycles. Infrared cameras are triggered by an infrared sensor that detects the movement of heat. The cameras record 30 seconds of motion using Infrared light at night. The cameras record 30 seconds of standard colour video during the day.

Hair tubes were also deployed at suitable Bandicoot habitat sites for seven days and nights. Peanut butter, oats and honey was used as an attractant to the hair tubes and cameras.

Southern Toadlet

Areas of potential Southern Toadlet *Pseudophryne semimarmorata* habitat within the study area, including roadsides, drainage lines and wetlands, were traversed on foot to identify

Southern Toadlet calls during wet weather. When, calls were identified, Southern Toadlet was caught for positive identification.

Swamp Skink

Swamp Skink *Egernia coventryi* was surveyed using Elliot traps, which were deployed along transects within suitable habitat, including roadsides, drainage lines and wetlands. Peanut butter, oats and honey were used as bait. Traps were left out two nights during mild-warm weather and were checked each morning. Swamp Skink also had the potential to be detected during targeted survey for Glossy Grass Skink.

Incidental Survey

Non-target amphibians, reptiles, birds and mammals were subject to incidental survey during targeted searches undertaken with a particular emphasis placed on threatened species using the following methods:

- Birds were identified by sight and vocalisation. Wetland birds were surveyed throughout the day. Woodland birds were surveyed between dawn and midday and in the hour preceding nightfall.
- Reptiles were identified by sight during general inspection of habitat.
- Reptiles and small mammals, including White-footed Dunnart *Sminthopsis leucopus* were surveyed for incidentally using the Glossy Grass Skink methods detailed above.
- Mammals were identified by sight.
- Amphibians were identified by vocalisation and sight, including spotlighting and fish trapping within a selection of appropriate amphibian habitat during Growling Grass Frog surveys.

A fauna species list (or defined area list) for the entire study area was compiled for each property and for the entire study area. This included species recorded in the study area and those flying over or heard close to the study area.

Assessments of fauna habitat were made by direct observation during the assessment.

11.1.3 Research permit

All fauna sampling within the study area was carried out under Research Permit Numbers 10002918 (Practical Ecology) and 10004056 (Mal's Environmental and Ecological Services).

11.2 Data Handling and Storage

11.2.1 Database Entry, Validation and Submission

All species of fauna recorded are coded using the DSE Biodiversity Information Group standards as part of Practical Ecology's data-sharing agreement with DSE. Lists of all fauna taxa detected throughout the survey within the study area were submitted to DSE as a contribution to the Atlas of Victoria Wildlife for future reference. These records are submitted in the standardised spreadsheet provided by DSE Biodiversity Information Group.

11.3 Mapping

Geographic data collection in the field for the purposes of map display was carried out with a handheld GPS for recording significant fauna species locations. Determination of habitat boundaries in Figure 3 was undertaken by a combination of ground-truthing and aerial photography interpretation. All maps were produced using ArcView ArcGIS V.9.

12. FAUNA LIMITATIONS

Fauna surveys were undertaken only for targeted species listed in table 3 and only within properties for which permission to access was granted to Practical Ecology by landholders (Figure 3). No targeted fauna survey was commissioned by Growth Areas Authority for other threatened species which have potential to occur within the study area, including Swift Parrot *Lathamus discolor* and a suite of other threatened woodland and wetland birds.

No general fauna survey for non-threatened species was commissioned by Growth Areas Authority, including trapping, spotlighting, bat detection, frog and owl call-back detection. Non-target fauna and some threatened fauna were not adequately surveyed during the current assessment.

Practical Ecology was not commissioned by Growth Areas Authority to map potential habitat for fauna species known or expected to occur within the study area. In addition, at the time of fauna survey, Practical Ecology had not been commissioned to prepare biodiversity reports, and we were therefore not required at the time to consider fauna habitat or record the likelihood of occurrence for threatened species. Areas of high faunal habitat significance shown in Figure 3 were determined by a combination of our recollection of the sites assessed, arborist data and aerial photography interpretation. No habitat mapping using hand-held GPS was undertaken in the field. Furthermore, Habitat Zones described in Part 2 of this report do not constitute all fauna habitat within the study area. Practical Ecology was not engaged at the time of our field assessments to map non-indigenous habitat, within which many fauna species occur.

The timing of the survey was less than optimal for most of the targeted threatened species. Detailed surveying to determine the likely presence or absence of species is best undertaken throughout all seasons of a typical year. While the primary Growling Grass Frog breeding season is from August to April, the optimal male calling period is from September to December, and calling is usually stimulated by rain events (DEWHA 2009). Unseasonal weather conditions including a period of cold weather during the survey period prevented Growling Grass Frog survey. Increasingly cool weather prevented the commencement of Growling Grass Frog survey in Precinct 16.

Fauna survey was carried out within a selection of properties that displayed suitable habitat. A sample approach to fauna survey was undertaken due to the large size of the study area and time constraints. Not all properties for which permission was granted were surveyed; however, an assessment of the habitat suitability for particular fauna species within unassessed properties was undertaken, based on the results of assessments undertaken in nearby similar habitats.

One property owner refused permission for Practical Ecology to access their properties for the fauna survey (Figure 3). This property comprised one property parcel (PFI: 680442) at 1105 Glasscocks Road Narre Warren South.

13. FAUNA RESULTS

13.1 Fauna records from the current assessment

A total of 46 fauna species were recorded incidentally within the study area during the current assessment. Fauna records comprise one amphibian, no reptiles, 39 birds, no invertebrates, no fish and six mammals. Thirty-six species (73%) are native, while 10 species (27%) are introduced. Fauna records from the current assessment are provided in Appendices 2, 3 and 4).

13.1.1 Significant species recorded during the current assessment

Two species recorded within the current assessment are considered to be of regional significance (Table 3). Methods for defining conservation significance are described in Appendix 1. Significant fauna recorded outside the study area during the current assessment are listed in Appendix 2.

Table 3. Significant native fauna recorded during the current assessment

Common Name	Scientific Name	Conservation Significance			
		EPBC	FFG	DSE (2007)	Regional Conservation Status
BIRDS					
Flame Robin	*Petroica phoenicea*				Regional
MAMMALS					
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*				Regional

Areas of habitat within the study areas for national and state significant species found in the study area are shown in Figure 3 and discussed in section 13.3.

13.2 Database Records and Previous Surveys

A total of 232 fauna species are documented on DSE's VFD (DSE 2007a) from within 5 km of the study area boundary. These records comprise 213 (91%) indigenous species and 19 (9%) introduced species. Forty-eight national and state significant fauna species recorded or predicted to occur within five kilometres of the study area are documented on the Victorian Fauna Database (DSE 2007a) and EPBC Protected Matters Search Tool (Appendix 5). Two state significant species, Cape Barron Goose *Cereopsis novaehollandiae and* Eastern Eastern Great Egret *Ardea modesta*, were recorded outside of the study area during the current assessment (Figure 2 Table 4). One of these species; Cape Barron Goose, is not recorded or predicted to occur within five kilometres of the study area.

In determining 'likelihood of occurrence' and utilisation of the study area by national or state significant fauna, the following factors were considered.

- The conservation status of the species and its distribution.
- Previous recordings of species in the local area.
- The quality, distribution and availability of suitable habitat for individual species.
- The generally fragmented and highly modified nature of fauna habitat surrounding the study area.

Based on the review criteria detailed above, nine species recorded on AVW and EPBC searches are considered to have a high likelihood of occurrence within the study area. A further 13 threatened species are considered to have a moderate likelihood of occurrence within the study area (Appendix 5). The habitat requirements for significant species detected on AVW and EPBC searches are discussed in Appendix 5. A summary of nationally and state listed threatened species with at least a moderate likelihood of occurrence is presented in table 5 below.

Table 4. Nationally or state listed threatened species with at least moderate likelihood of occurrence recorded or predicted to occur within 5km

FFG	EPBC	DSE	Mig.	Regional Significance	Common Name	Scientific Name	Family Name	Likelihood of Occurrence	Database	Freq (AVW only)
		v		S, R2	Australasian Shoveler	*Anas rhynchotis*	Anatidae	Moderate	AVW	2.04%
L		v		S, R2	Baillon's Crake	*Porzana pusilla*	Rallidae	Moderate	AVW	0.22%
L		e		S, R2	Blue-billed Duck	*Oxyura australis*	Anatidae	Moderate	AVW	2.27%
		n		R1, R2	Brown Quail	*Coturnix ypsilophora*	Phasianidae	Moderate	AVW	0.22%
		n			Cape Barron Goose	*Cereopsis novaehollandiae*	Anatidae	High	current assessment	
	m		J, C	R2, R3	Cattle Egret	*Ardea ibis*	Ardeidae	High	EPBC	
L	VU	v		N, S, R2	Dwarf Galaxias	*Galaxiella pusilla*	Galaxiidae	Moderate	EPBC/AVW	0.22%
L	m	v	J, C	S, R2, R3	Eastern Great Egret	*Ardea modesta*	Ardeidae	High	AVW	0.45%
	m		J, C, R	R1, R2, R3	Fork-tailed Swift	*Apus pacificus*	Apodidae	High		
L		e		S, R2	Freckled Duck	*Stictonetta naevosa*	Anatidae	Moderate	AVW	0.22%
L	VU	e		N, R2	Growling Grass Frog	*Litoria raniformis*	Hylidae	Moderate	EPBC	
		v		S, R2	Hardhead	*Aythya australis*	Anatidae	High	AVW	2.50%
L		c		S, R2	Intermediate Egret	*Ardea intermedia*	Ardeidae	Moderate	AVW	0.22%
		n		S, R2	Latham's Snipe	*Gallinago hardwickii*	Scolopacidae	High	AVW	2.27%
		v		S, R2	Musk Duck	*Biziura lobata*	Anatidae	Moderate	AVW	0.45%
		n		S, R2	Pied Cormorant	*Phalacrocorax varius*	Phalacrocoracidae	High	AVW	0.45%
		v		S, R2	Royal Spoonbill	*Platalea regia*	Threskiornithidae	High	AVW	0.90%
	m			R2, R3	Rufous Fantail	*Rhipidura rufifrons*	Dicruridae	Moderate	EPBC	
	m			R2, R3	Satin Flycatcher	*Myiagra cyanoleuca*	Dicruridae	Moderate	EPBC	
		v		S, R2	Southern Toadlet	*Pseudophryne semimarmorata*	Myobatrachidae	High	AVW	11.59%
		n		S, R2	Spotted Harrier	*Circus assimilis*	Accipitridae	Moderate	AVW	0.45%
L	EN	e		N, S, R1, R2	Swift Parrot	*Lathamus discolor*	Psittacidae	Moderate	EPBC/AVW	0.22%
	m		J, C, R	R2, R3	White-throated Needletail	*Hirundapus caudacutus*	Apodidae	High	EPBC	

See Appendix key for conservation status and significance definitions

13.3 Fauna habitats

The majority of the study area has been highly modified by grazing and urbanisation. Large open paddocks lined with planted exotic vegetation dominate the precinct. However, native vegetation is present within farm dams, roadsides and as small remnants within farmland. While most of the trees within the Habitat Zones across the study area are too young to have formed hollows, the few hollow bearing trees that do remain are likely to support a suite of hollow dependant species such as parrots, rosellas, lorikeets, owls, arboreal mammals and microbats.

Areas of regenerating and remnant Swamp Scrub EVC and exotic vegetation with Swamp Scrub components found within roadsides provide habitat for amphibians, reptiles, birds, mammals and invertebrates; including threatened species (Figure 3). Habitat dominated by non-indigenous vegetation also occurs in roadsides and fence-lines as exotic trees and shrubs and supports many animals, including woodland birds, Swamp rat *Rattus lutreolus* and potentially arboreal mammals. Drainage lines dominated by introduced flora are likely to be habitat for native amphibians (figure 3).

Farm dams, drainage-lines and seasonally wet areas within the study area hold particular habitat value for wetland birds, including migratory and threatened species. A network of drainage-lines within the study area are connected to large areas of Tall Marsh EVC immediately adjacent to the study area and are potential habitat for a suite of amphibians, birds and reptiles. Two threatened wetland bird species were recorded outside the study area within drainage-line and wetland habitats, therefore, similar habitats within the study area can be considered highly likely to be utilised by habitat for these two threatened species. Other threatened species, including a suite of threatened wetland birds are also considered at least moderately likely to utilise this habitat.

The determination of areas classified as having high faunal habitat values is based on all or any of the following factors.

- The area is a representative or remnant vegetation community.
- The area constitutes a wildlife corridor.
- The area contains important breeding sites.
- The area has high floristic diversity.

The study area has been divided up into five habitat types. An evaluation of each of the habitat types is described below.

Woodlands

Remnant woodlands are highly restricted within the study area and occur only as a highly modified roadside remnant and as non-indigenous native and exotic planted trees within farmland.

Some of the trees within woodlands at the study area have hollows suitable for hollow-dependent fauna such as arboreal mammals, bats and birds. There are some logs present from fallen branches and trees, which provide habitat for skinks, invertebrates and small mammals. However, large logs are noticeably absent in areas of woodland, as evident in many of the habitat hectare scores (Flora Appendix 2).

Many fence-lines and private roadsides within the study area are lined with planted trees and shrubs, including non-indigenous Eucalypts, **Cypress* spp, **Pinus* spp and European trees. While these areas do not hold the floristic diversity of remnant woodlands, they may offer food and shelter resources for fauna, including woodland birds and arboreal mammals (Bennett et al 2000). Non-indigenous Eucalypts were not surveyed during field assessments. However, an Arboricultural report was relied upon to identify stands of non-indigenous Eucalypts for determination of woodland habitat for threatened species (Callander 2008). Woodland habitat is displayed in Fauna Figure 3.

Woodlands in the study area provide limited potential habitat for a number of threatened birds including Swift Parrot *Lathamus discolour.*

Wetlands (including surrounding vegetation)

Farm dams throughout the study area also offer habitat of varying quality for significant fauna (Figure 3). Dams with fringing native vegetation offer high quality habitat for wetland birds and amphibians (Pizzey & Knight 2007; Hero et al 1991). Some dams hold little fringing vegetation due to impacts by stock and are therefore less valuable. However, these dams may also be utilised by wetland birds, including threatened species. All wetlands in the study area are potential habitat for birds, amphibians, reptiles and insects.

The constructed wetlands outside the northern boundary of the study area offer good habitat values for the regions indigenous fauna and are connected via drainage-lines to the study area. These habitat values may improve as the wetland floristic diversity increases and habitat values develop.

Drainage lines

Drainage lines within the study area provide potential habitat for Glossy Grass Skink *Pseudemoia rawlinsoni*, Swamp Skink *Egernia coventryi* and a range of other reptiles, birds, amphibians and invertebrates. Drainage lines may also serve as migratory routes for Dwarf Galaxias during times of flood.

Swamp Scrub

Remnant and regenerating Swamp Scrub and Swampy Woodland within roadsides (Part 2 Figure 2) provides fauna habitat in many sections of the study area. Many roadsides are highly modified and do not meet DSE native vegetation cover thresholds in order to be determined to be a 'patch' of native vegetation (DSE 2004). Many of these roadside areas constitute a modified version of Swamp Scrub which is potential fauna habitat in many parts of the study area.

Roadsides of particular habitat significance within the study area include the southern section of Clyde road at the intersection of Thompsons road. This site offers potential habitat for Swamp Skink, Glossy Grass Skink and Southern Toadlet, in addition to a suite of other reptiles, amphibians, mammals, invertebrates and birds.

Other patches of roadside vegetation are dominated by exotic plantings and introduced shrubs such as Boxthorn **Lycium ferocissimum*. Exotic plantings and weed infestations such as Boxthorn thickets provide potential habitat for woodland birds and other ground dwelling and arboreal mammals.

Other roadsides in the study area are dominated by exotic grasses with occasional trees. These areas may support retiles and ground-dwelling mammals and are potentially important dispersal routes for fauna. Roadside drains are important for threatened species such Glossy Grass Skink, Southern Toadlet and Swamp Skink.

Farmland and exotic vegetation

Areas of farmland and exotic vegetation serve a less important role as habitat for most native species. However, Eastern Great Egret *Ardea modesta* and Cape Barron Goose *Cereopsis novaehollandiae* were observed within 300 metres of the precinct boundary within such habitats. These species were recorded in seasonally wet open fields, near drainage lines and in wetlands.

A number of the more generalist bird species and raptors were recorded throughout farmland within the study area. Open farmland areas and open areas fringing vegetation are important hunting grounds for raptors such as Black-shouldered Kite *Elanus axillaris*, Whistling Kite *Haliastur sphenurus* and Nankeen Kestrel *Falco cenchroides* (Pizzey and Knight 2007).

The Southern Brown Bandicoot is also known to utilise areas of exotic vegetation on farms and within roadsides for feeding. Nesting sites of the Southern Brown Bandicoot have been observed under rubbish and material dumps in Cranbourne Botanic Gardens (McCaffrey & Legg 2007) and these types habitats exist within the Precinct 16 study area. However, Southern Brown Bandicoot has a low likelihood of occurrence within the study area, due primarily to: the limited occurrence of suitable habitat such as Heathy Woodland and Grassy Woodland EVCs; the distance from known populations; and the high incidence of Red Fox *Vulpes vulpes* within the study area.

There appears to be a high-presence of rabbits and foxes throughout this habitat, based on the amount of fresh scats.

13.3.1 Habitat Corridors

All of the Habitat Zones mapped in the study area achieved a score of ≤5 out of a possible 25 in the landscape component of the habitat hectare assessments. This low score range indicates that Habitat Zones within the study area are small in area and are distanced from

surrounding native vegetation. The closest areas of significant remnant native vegetation are on the Cardinia Creek, listed as regional Biosite #6888 *Cardinia Creek (lower)* by DSE (2005b), and within the Officer Precinct to the north. The Cranbourne Botanic Gardens is approximately six kilometres to the south west and is also a listed Biosite (DSE 2005b).

While the study area has been substantially modified, nearby threatened species records; Glossy Grass Skink *Pseudemoia rawlinsoni* and Southern Toadlet *Pseudophryne semimarmorata* located within lineal roadsides and drainage lines in the adjacent PSP 13: *Clyde North* demonstrate that these species can persist and disperse through narrow and modified corridors. Habitat corridors such as these are therefore highly important for fauna within the study area.

13.4 Threatened species occurring or likely to occur

13.4.1 Threatened species recorded during the current assessment

No state or nationally significant fauna species were recorded within the study area during the current assessment.

Two state significant species, Cape Barron Goose *Cereopsis novaehollandiae* and Eastern Great Egret *Ardea modesta*, were recorded outside the study area during the current assessment (Figure 2). Similar habitats to those within which the two species were recorded occur within the study area. A summary of the habitat requirements of threatened species recorded outside the study area during the current assessment is presented in the following section. Locations of threatened species recorded by Practical Ecology within Precinct 13 Clyde North and within the former PSP 16 study area are displayed in Figure 2.

Cape Barren Goose

Cape Barren Goose *Cereopsis novaehollandiae* is listed as near threatened in DSE's Advisory List of Threatened Vertebrate Fauna in Victoria (DSE 2007). This species was recorded incidentally during targeted searches for threatened species within Precinct 16 by Practical Ecology (2009).

Cape Barren Goose is a water bird ranging in size from 75 to 90cm; it is a light grey colour with dark spots on the wings and tail tips. The bird has pink legs and dark webbed feet and an obvious yellow cere covering most of the black bill (Marchant and Higgins 1990).

Cape Barren Goose is generally restricted to the southern coastline on mainland Australia and Tasmania; however, the largest populations exist on offshore islands (Eberhard and Pearse 1981; Pizzey and Knight 2007). The bird is commonly found in grasslands and terrestrial wetlands including brackish wetlands. They forage on grasses and pasture crops, especially improved pasture and occasionally can be seen foraging in shallow water (Eberhard and Pearse 1981, Marchant and Higgins 1990, Pizzey and Knight 2007).

Eastern Great Egret

Eastern Great Egret *Ardea modesta* is listed as threatened under the *Flora and Fauna Guarantee Act 1998* and as near threatened under the DSE's Advisory List of Threatened Vertebrate Fauna (DSE 2007). Eastern Great Egret was recorded incidentally during targeted searches for threatened species within Precinct 16 by Practical Ecology (2009).

Eastern Great Egret is a large white bird of a height up to 1 metre and a wingspan of 1.5 metres (Marchant and Higgins 1990, Pizzey and Knight 2007). Eastern Great Egret is a cosmopolitan species occurring in southern Europe, Asia, Indonesia, Africa, South Americas, New Zealand and Australia (excluding the dry interior) (Marchant and Higgins 1990).

Eastern Great Egret is most commonly seen in shallow terrestrial wetlands, damp grasslands, tidal mudflats, irrigation areas, sewage ponds and estuarine areas; it will generally avoid wetlands or waterways with deep pools (Marchant and Higgins 1990). It forages in shallow waters for fish (Marchant and Higgins 1990, Pizzey and Knight 2007).

13.4.2 Significant fauna likely to occur within the study area

Forty-eight species of national, state or regional significance have been recorded within the local area (5km radius from the middle of the study area) or have been predicted to occur by DEWHA (2009) (Appendix 5). Twenty-three of these species are considered to have at least a moderate likelihood of occurrence the study area or find critical habitat within the study area.

Recent fauna survey undertaken by Practical Ecology (2009) and Practical Ecology (*in prep*) in neighbouring Precincts and Investigation Areas have recorded several significant species in similar habitats within several hundred metres of the study area, including:

- Australasian Shoveler *Anas rhynchotis*
- Eastern Great Egret *Ardea modesta*
- Hardhead *Aythya australis*
- Royal Spoonbill *Platalea regia,* and
- Southern Toadlet *Pseudophryne semimarmorata*

The habitat requirements for species occurring or predicted to occur within 5km are briefly discussed in Appendix 5. Species considered to have at least a moderate likelihood of occurrence within the study area are discussed below.

Australasian Shoveler *Anas rhynchotis*

Australasian Shoveler occurs mainly on large well vegetated wetlands and lakes, occasionally including areas with saline waters. Populations are found in higher numbers on permanent, well-vegetated freshwater swamps with areas of open water (Rogers 1990).

This species nest in grass nests on the ground, usually in dense cover and near water (Pizzey and Knight 2007).

Australian Shoveler has been assigned a high likelihood of occurrence within the study area. The species has been recorded 30 times from within five kilometres of the study area and was last recorded in 2005 according to the DSE's AVW (DSE 2007a). In addition, Australian Shoveler was recorded by Practical Ecology in 2008 during a separate ecological investigation within several hundred metres of the Precinct 16 study area, in wetlands near Thompsons road, Cranbourne East (Fairbridge & Appleby 2009).

Blue-billed Duck *Oxyura australis*

Blue-billed Duck inhabits deep, permanent, well-vegetated swamps, but at times (especially in winter) may occur in large numbers on large open wetlands (Pizzey and Knight 2007). The Blue-billed Duck catches food while diving or occasionally by feeding from the water surface. Their nests are built on trampled swamp vegetation around the base of established stands of reeds and rushes, often over water or on small islands (Rogers 1990).

Blue-billed Duck has been assigned a moderate likelihood of occurrence within the study area. The species has been recorded 30 times within five kilometers of the study area and of which the most recent was in 2002 (DSE 2005a).

Cattle Egret *Ardea ibis*

Cattle Egret is a migratory species. Cattle Egret occurs in many types of wetlands; from tidal flats in estuaries and bays to the margins of inland lakes, swamps and rivers (Pizzey and Knight 2007). They also use farm dams, mangroves, flooded areas, and artificial wetlands created by irrigation. Cattle Egret are often seen foraging away from water in crops and pasture, they build stick-nests in trees, usually surrounded by water or dense treed cover, or occasionally in reed-beds (O'Brien 1990). The species nests colonially, often with other waterbirds. Egrets have become threatened due to development and removal habitat used for nesting sites.

Cattle Egret has been assigned a high likelihood of occurrence within the study area. A number of wetlands throughout the study area offer suitable habitat for Cattle Egret. This species was predicted to occur on DEWHA's *Protected Matters Search Tool* (DEWHA 2009).

Eastern Great Egret *Ardea modesta*

Eastern Great Egret was recorded outside the study area during the current assessment (See above).

Freckled Duck *Stictonetta naevosa*

This species can occur on fresh water swamps, creeks, ponds, dams, reservoirs, sewage ponds and other ephemeral wetlands. It needs a thick cover of vegetation such as bulrush, lignum or tea-tree for nesting (Rogers 1990).

Freckled Duck has been assigned a moderate likelihood of occurrence within the study area. The species has been recorded twice within five kilometres of the study area, of which the most recent was in 2002 (DSE 2005a).

Growling Grass Frog *Litoria raniformis*

This species often inhabitants water bodies with a diverse assemblage of aquatic vegetation, including emergent species such as sedges *Gahnia* spp., submergent species such as curly pondweed *Potamageton* spp., floating species such as water ribbon *Triglochin* spp. and filamentous algae (Hamer and Organ 2006, Heard et al. 2004a). Aquatic vegetation provides sites for male frogs to call from, sites for eggs to be deposited and remain relatively safe during development, and for food and shelter for tadpoles. Dense submergent vegetation is especially important to protect eggs and tadpoles from predation (Heard et al. 2004).

Growling Grass Frog has not been recorded within 5km of the study area (DSE 2005a). The nearest Growling Grass Frog habitat of moderate quality is within sections of the Cardinia Creek, within 5km of the study area (Costello et al 2003). This species is predicted to occur by DEWHA (2009).

Suitable Growling Grass Frog habitat exists within the wetlands and drainage-line in the north of the study area (outside the current PSP boundary). Growling Grass Frog has therefore been assigned a moderate likelihood of occurrence within the study area, however, habitat within the revised PSP area is considered poor. Two farm dams in property PFI# 206233621 in the north of the PSP area do not comprise highly suitable habitat for the species. Growling Grass Frog has therefore been assigned a low likelihood of occurrence within the PSP area.

Hardhead *Aythya australis*

Hardheads inhabit deep to shallow wetlands with open water and fringing emergent vegetation (Pizzey and Knight 2007). The species feeds by diving in deep water and occasionally by dabbling just under the water surface (Rogers 1990). Nests are built in thick vegetation such as reeds, lignum and cumbungi, usually over water (Rogers 1990; Halse et al. 2005). These birds are most common in the wetland systems of inland Australia (Halse et al. 2005). Birds visit Victoria from these areas in spring and summer, returning as the northern wetlands are replenished by rain (Halse et al. 2005). However, some birds are present in Victoria all year round depending on the suitability of wetland habitats (Pizzey and Knight 2007).

Hardhead has been recorded 42 times within five kilometers of the study area in recent years, including the most recent record of 2005 (DSE 2005a). Hard head was recorded by Fairbridge & Appleby (2009) in wetlands within 300 metres south of the study area.

Intermediate Egret *Ardea intermedia*

The Intermediate Egret occurs in the shallows of mainly grassy inland wetlands, flooded pastures or grasslands. They only occasionally visit coastal wetlands and are generally rare in Victoria. They are sometimes seen foraging in pastures with grazing cattle. This species builds platform nests which are built in trees in riverine forest, swamp woodland and mangroves (Pizzey and Knight 2007).

Intermediate Egret has been assigned a moderate likelihood of occurrence within the study area. One record from 1977 is listed on DSE's AVW within five kilometers (DSE 2005a). This species is predicted to occur by DEWHA (2009).

Latham's Snipe *Gallinago hardwickii*

Latham's Snipe is a migratory species. The species migrates to Victoria from breeding grounds in Japan. In Victoria this species is widely distributed in a range of habits including heavily vegetated freshwater swamps, and pools or ditches in heaths or subalpine herblands (Pizzey and Knight 2007). Lathams's Snipe also occurs in small ephemeral wetlands such as wet depressions after floods recede. They generally roost in thick vegetation during the day, sometimes under shrubs away from wetlands, and will feed in swamps at night. They are occasionally seen feeding during the day. This species feeds by probing in soft mud and rarely moves far from concealing vegetation (Higgins and Davies 1996).

Latham's Snipe has been assigned a moderate likelihood of occurrence within the study area. The species has been recorded 30 times within five kilometres of the study area, of which the most recent was in 2004 (DSE 2005a).

Musk Duck *Biziura lobata*

Musk Duck is usually seen in small numbers on the deep waters of well vegetated fresh to saline lakes, swamps and occasionally shallow inlets and bays. Nests are formed in low vegetation in areas sheltered by surrounding vegetation (Pizzey and Knight 2007).

Musk Duck has been assigned a moderate likelihood of occurrence within the study area. The species has been recorded 14 times within five kilometres of the study area, of which the most recent was in 1992 (DSE 2005a).

Pied Cormorant *Phalacrocorax varius*

This species is most often found along the coast, however Pied Cormorant are also known to use inland wetlands including billabongs, deep and open swamps and rivers (large freshwater and saline wetlands). They nest in colonies, building platforms nests in mangroves or other trees (Pizzey and Knight 2007).

Pied Cormorant has been assigned a med-high likelihood of occurrence within the study area. The species has been recorded twice within five kilometers of the study area, of which the most recent was in 1997, including one record of within 100 meters (DSE 2005a).

Royal Spoonbill *Platalea regia*

The Royal Spoonbill inhabits the shallow parts of fresh and saline wetlands; these birds are gregarious and are often found in small flocks. They are mostly common on intertidal mudflats in coastal bays. Their stick-nests are built in reeds, shrubs or trees, singly or in loose colonies and are often seen with other species (Rogers 1990).

Royal Spoonbill was recorded within the nearby Precinct 13 in 1997 (DSE 2005a). Royal spoonbill has been assigned a high likelihood of occurrence within the study area. The species has been recorded 23 times within five kilometres of the study area, of which the most recent was in 2001 (DSE 2005a).

Southern Toadlet *Pseudophryne semimarmorata*

The Southern Toadlet can be found in dry forest, woodland, shrubland, grassland and heaths. It shelters under leaf litter and other debris in moist soaks and depressions. Their eggs are spawned in shallow burrows under organic litter in low areas close to water (Hero et al. 1991).

Southern Toadlet has been given a high likelihood of occurrence within the study area and was recorded during targeted searches for the species by Practical Ecology in the nearby Precinct 13 in 2009. The species was also recorded within the Precinct 13 study area in 1965 (DSE 2005a). AVW records have the species has recorded twice within five kilometres of the study area, of which the most recent was in 1965 (DSE 2005a).

Spotted Harrier *Circus assimilis*

Spotted Harrier occurs in open grasslands, open shrublands, saltbush, open woodlands, crops and similar low vegetation that allows for hunting. Their stick nests are built in low trees (Pizzey and Knight 2007).

Spotted Harrier has been assigned a moderate likelihood of occurrence within the study area. The species has been recorded four times within five kilometers of the study area, of which the most recent was in 2004 (DSE 2005a).

Swift Parrot *Lathamus discolor*

The Swift Parrot is a winter migrant to Victoria (Swift Parrot Recovery Team 2001) from their breeding areas in Tasmania, however small numbers of non-breeding birds may remain here during summer (Higgins 1999, Swift Parrot Recovery Team 2001). They are nomadic, and follow the flowering of trees and psyllid infestations. In Victoria their distribution is centred on box-ironbark forests, but they are often seen in town parks and occur sporadically elsewhere in dry forests, dry woodlands and wooded farmlands but are seldom seen in treeless areas, rainforests or wet forests (Higgins 1999, Pizzey and Knight 2007). They feed mainly in winter-flowering plants in Victoria, especially Red Ironbarks and ornamental trees and shrubs (Higgins 1999, Swift Parrot Recovery Team 2001).

Swift Parrot has been assigned a moderate likelihood of occurrence within the study area. The species has been recorded five times within five kilometers of the study area, of which

the most recent was in 1989 (DSE 2005a). This species is also predicted to occur by DEWHA (2009).

White-throated Needletail *Hirundapus caudacutus*

White Throated Needletail is a migratory species. It is almost entirely aerial and occurs over many types of habitat (Pizzey and Knight 2007).

White-throated Needletail has been assigned a high likelihood of occurrence within the study area. No records are listed on DSE's AVW within five kilometers (DSE 2005a). The species is however, predicted to occur by DEWHA (2009).

Fork-tailed Swift *Apus pacificus*

The Fork-tailed Swift is a migratory species occurring throughout Australia. This species is almost entirely aerial, however it is known to roost on cliffs or in very large trees (Pizzey and Knight 2007).

Fork-tailed Swift has been assigned a high likelihood of occurrence within the study area. No records are listed on DSE's AVW within five kilometers (DSE 2005a). The species is however, predicted to occur by DEWHA (2009).

Baillon's Crake *Porzana pusilla*

This species is a summer migrant to Victoria. It inhabits freshwater wetlands and floodwaters usually containing floating plants or tall emergent vegetation. The Baillon's Crake feeds in shallow water, mud and emergent aquatic plants. It has been found to nest in clumps or tussocks of vegetation surrounded by water(Pizzey and Knight 2007).

Baillon's Crake has been assigned a moderate likelihood of occurrence within the study area and has been recorded twice within five kilometres of the study area since 1982 (DSE 2005a).

Brown Quail *Coturnix ypsilophora*

The Brown Quail is widespread in Victoria, however suitable habitats are quite localised. It has been reported from grass and sedge flats, often adjacent to rivers and swamps. Along major rivers in northern Victoria they occur in grassy River Red Gum forests and in eastern Victoria they inhabit wet woodlands and forests containing grasses and sword-sedges. It has also been observed in bracken, lucerne pastures, and potato crops. It feeds and nests on the ground (Marchant, S. and Higgins, P.J. (eds) 1993).

Brown Quail has been assigned a moderate likelihood of occurrence and has been recorded twice within five kilometres of the study area since 1977 (DSE 2005a)

Dwarf Galaxias *Galaxiella pusilla*

Dwarf Galaxias occurs in vegetated margins of slow-flowing coastal creeks, drains and swamps. Rare in Victoria, however more abundant in the south-east of the state in Mornington Peninsula & Western Port areas (Museum Victoria 2006).

Dwarf Galaxias has been assigned a moderate likelihood of occurrence. The species was predicted to occur by DEWHA (2009).

Black-faced Monarch *Monarcha melanopsis*

Black-faced Monarch is a summer migrant to the south-east coastal areas (Pizzey and Knight 2007. It is found in the understorey of rainforest, densley wooded areas, mangroves and areas with a dense canopy (Pizzey and Knight 2007).

Black-faced Monarch has been assigned a moderate likelihood of occurrence. The species was predicted to occur by DEWHA (2009).

Rainbow Bee-eater *Merops ornatus*

The Rainbow Bee-eater is a migratory species. It occurs in many types of habitat including woodland, shrubland, semi-cleared land and farmland, however it mainly occurs where eucalyptus species are dominant (Higgins 1999). It is almost entirely insectivirous and mostly occurs near to permanent water (Higgins 1999).

Rainbow Bee-eater has been assigned a moderate likelihood of occurrence. The species was predicted to occur by DEWHA (2009).

Rufous Fantail *Rhipidura rufifrons*

The Rufous Fantail is migratory and can be found in a variety of habitats including swampy woodland, rainforest, mangrove, dense wet forests. It is generally found where there is dense shade and thick understorey shrubs and bushes and is often seen close to the ground. It can be found in less dense habitats during migration and has been seen in many urban sites (Australian Museum 2008).

Rufous Fantail has been assigned a moderate likelihood of occurrence. The species was predicted to occur by DEWHA (2009).

Satin Flycatcher *Myiagra cyanoleuca*

Satin Flycatcher is a migratory bird and occurs in Victoria during the spring/summer months. It is generally found in wet dense forests and gullies (Australian Museum 2008).

Satin Flycatcher has been assigned a medium likelihood of occurrence. The species was predicted to occur by DEWHA (2009).

13.5 Relevant Policy and Legislation

The following section explores the two primary *Acts* pertaining to native fauna from national level and state jurisdictions.

13.5.1 Environment Protection and Biodiversity Conservation Act 1999

The *EPBC Act 1999* applies to sites where proposed developments or projects may have a *significant impact* on *matters of National environmental significance*.

Under the EPBC Act, the proponent must refer proposed actions that may require approval, to the Commonwealth Environment Minister. The Minister then decides which assessment and reporting option is applied. The Minister may approve a 'controlled action' allowing the development to proceed provided conditions are applied to mitigate significant impacts protected by this act.

Using the DEWHA's *Protected Matters Search Tool* (DEWHA 2009), 21 threatened species of national significance were predicted to occur within a 5km radius from the centre of the study area (Fauna Appendix 5). Five EPBC listed species were recorded within 5km of the study area on DSE's AVW (DSE 2007). No listed threatened species or communities were recorded during this survey. Two threatened species, listed under the EPBC Act 1999, have been recorded within five kilometres of the study area (Table 5).

Seven species listed as either migratory or threatened under the EPBC Act were assessed as having at least a moderate likelihood of occurrence within the study area (Section 13.2).

Any proposals for rezoning (or associated development) of the precinct need consider the potential impact on nationally significant fauna predicted to have at least a moderate likelihood of occurrence, and those that have been recorded within five kilometres of the study area. Given that there are EPBC listed species with at least moderately likely to utilise the study area, proposed rezoning would likely trigger a referral to DEWHA under the EPBC Act 1999.

13.5.2 Flora and Fauna Guarantee Act 1988

The *FFG Act 1988* was legislated to ensure the continued survival of all Victorian species of flora and fauna and all Victorian communities of plants and animals. A key component of the FFG Act is to ensure the sustainable use of flora and fauna resources whether they are threatened or not.

The FFG Act lists:

- threatened species of flora and fauna
- threatened communities of flora and fauna

- protected flora
- potentially threatening processes.

No fauna species listed as threatened under the FFG Act were recorded within the study area. There are also no listed threatened communities known to occur within the study area.

One species; Eastern Great Egret *Ardea modesta*, listed under the *FFG Act 1988,* was recorded outside the study area during the current assessment.

Eight FFG listed species were assessed as having at least moderate likelihood of occurrence within the study area (Section 13.4) (Appendix 5). One species, Eastern Great Egret *Ardea modesta* is considered to have a high likelihood of occurrence. Three of the eight FFG species likely to occur are also predicted to ocurr by DEWHA (2009) (Appendix 5).

Any proposals for rezoning (or associated development) of the precinct need consider the potential impacts on FFG-listed threatened fauna that have at least a moderate likelihood to occur within the study area, and those that have been recorded within five kilometres of the study area. Given that there are eight FFG listed species with at least a moderate likelihood of occurrence within the study area, FFG permits would need to be attained as part of any rezoning process.

14. FAUNA CONCLUSION

Cranbourne North (Stage 2) has the potential to support numerous threatened fauna species, including a suite of threatened wetland birds. Areas within 300 metres north of the study area currently support at least four threatened fauna species. Further survey at appropriate times of the year would enable a greater understanding of threatened species presence within the study area.

Habitat for threatened species is confined primarily to farm dams, drainage-lines and roadsides within the study area. These habitats also link larger, more diverse habitat sites within the region. Large areas of agricultural land within the study area have limited habitat value for fauna, with the exception of pasture near existing drainage lines and wetlands, which may serve as foraging grounds for wetland birds (Marchant and Higgins 1990).

It is estimated that about 7% of former native vegetation remains within the City of Casey, of which a significant proportion has been highly modified (McMillan et al. 2003). Patterns of vegetation clearance within the study area are consistent with those undertaken historically throughout the City of Casey, whereby, the majority of the study area has been cleared and remaining native vegetation has been modified to varying degrees. All remnant vegetation and all remaining habitat, both indigenous and non-indigenous, is therefore significant as a local source of biodiversity and should be prioritised for retention and on-going ecological management as part of the Cranbourne North (Stage 2) rezoning and future development.

Indigenous habitat within the study area comprises farm dams, constructed drainage-lines, Swamp Scrub and Swampy Woodland (found on roadsides and drainage lines) (Figure 3).

Non-indigenous habitat comprises planted non-indigenous Eucalypts and other established tree species along fence-lines and roadsides (Figure 3). In addition, some drainage lines and roadsides are dominated by exotic vegetation which serves as habitat, including habitat for threatened wetland birds and amphibians (Figure 3). Established trees, especially Eucalypts should be retained for their value as habitat for threatened woodland birds. All other areas of habitat, both indigenous and non-indigenous should also be retained.

The rezoning and development of the study area must consider impacts to fauna due to the known occurrence of threatened fauna near to the study area and the at least moderate likelihood of occurrence of a suite of threatened woodland and wetland birds, mammals and amphibians. The relatively small proportion of habitat area remaining within the study area presents an opportunity for the retention of these valuable remnants within the context of rezoning of the precinct and associated future development.

Careful consideration should be given to wetlands and drainage lines within the study area and the potential for the development to alter hydrology. Farm dams within the study area are particularly important areas of faunal habitat, including habitat for threatened wetland birds, considering that several significant wetland birds were recently recorded within 300 metres of the study area.

Roadsides are also particularly important high priority retention areas, given the occurrence of Southern Toadlet and Glossy Grass Skink within nearby roadside habitats; including within sites not mapped as meeting DSE (2004) cover thresholds for native vegetation. Given the occurrence of threatened species within these highly modified habitats, and the frequent occurrence of similar habitats throughout roadsides in the study area, roadsides are highly likely to be serving as dispersal corridors for a range of species, including threatened species that may occur within the study area.

A reserve system, combining public open space, buffer zones, revegetation areas and existing habitat managed for conservation, should be incorporated into the rezoning process. Priority should be given to:

- the retention and conservation of all areas of remnant EVC habitat
- the retention of all areas of habitat for threatened fauna species (including areas dominated by exotic or non-indigenous flora)
- the establishment of habitat corridors between remnant vegetation
- the rehabilitation of highly modified habitat linking remnant vegetation
- the establishment of habitat corridors which integrate this study area with habitat values within neighbouring precincts and beyond.

Areas of non-indigenous vegetation defined as public open space within the Precinct development, should also be incorporated into buffer zones to protect and enhance areas of fauna habitat. There is also potential to utilise roads and footpaths wherever possible to separate reserves from development areas.

Furthermore, 74 hectares of the study area is encumbered with an LSIO (DPCD 2009). This area would be best incorporated into a reserve system and broad-scale ecological restoration project, aimed at restoring the wetland habitats and creating revegetated links between habitats.

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Fauna Appendix 1. Methodology for Defining Significance

This section outlines the assessment methods or criteria used to determine the significance of species, plant communities, fauna habitats and sites. Criteria are consistent with government policies, legislation and publications.

Fauna

The level of significance for fauna species is determined according to the definitions below:

International Significance	Migratory species protected under international treaties (JAMBA, CAMBA, ROKAMBA and Bonn) or listed on the IUCN Red Data List 2006 as threatened
National Significance	Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* as extinct, extinct in the wild, critically endangered, endangered or vulnerable.
State Significance	Species listed as Threatened under Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988* Species listed as extinct, critically endangered, endangered, vulnerable in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007)
Regional Significance	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007)
Local Significance	Species considered rare, threatened or uncommon within the local area (5km radius from the study area) by the authors with consideration given to previous studies. Many native species are considered to be locally significant within urban areas due to typically high levels of habitat alteration.

Fauna Appendix 2. Threatened species recorded outside study area during the current assessment

Cranbourne North (Stage 2) study area assessment period: 20/3/2009 to 17/5/2009. Fauna taxa recorded within the study area during this survey by Malcolm Legg of Mal's Ecological and Environmental Services

			Conservation Status								
Common Name	**Scientific Name**	**Area Observed**	**EPBC**	**FFG**	**DSE (2007)**	**Number of individuals**	**Date**	**Time**	**Weather Conditions**	**GPS coordinates**	**Type of record**
Eastern Great Egret	*Ardea modesta*	Drainage line adjacent to Glasscocks Road		L	v	1	30/04/09	11.22am	Overcast 18'C	38*04'21.324"S 145*19"20.898"E	heard/ seen
Eastern Great Egret	*Ardea modesta*	Drainage line near Cranbourne/Berwick rd		L	v	1	12/05/09	9.46am	Overcast 14'C	38*04'06.702"S 145*19'48.648"E	heard/ seen
Cape Barron Goose	*Cereopsis novaehollandiae*	Exotic Grassland in north of study area			n	2	12/05/09	9.47am	Overcast 14'C	38*04'05.142"S 145*19'51.996"E	heard/ seen

Codes for DSE (2007) Conservation Status

- v vulnerable in Victoria (DSE 2007)
- e endangered in Victoria (DSE 2007) or Australia (EPBC Act)
- n near threatened in Victoria (DSE 2007)

Fauna Appendix 3. Fauna recorded during the current assessment

Cranbourne North (Stage 2) study area assessment period: 20/3/2009 to 17/5/2009. Fauna taxa recorded incidentally and during targeted searches for threatened searches from within the study area during this survey by Malcolm Legg of Mal's Ecological and Environmental Services.

Scientific Name	Common Name	Conservation status within site.	Type of record
AMPHIBIANS			
Crinia signifera	Common Froglet	Common	Lh
BIRDS			
Tachybaptus novaehollandiae	Australasian Grebe	Uncommon	Lhs
Gymnorhina tibicen	Australian Magpie	Common	Lhs
Corvus coronoides	Australian Raven	Common	Lhs
Threskiornis molucca	Australian White Ibis	Common	Lhs
Chenonetta jubata	Australian Wood Duck	Common	Lhs
Cygnus atratus	Black Swan	Rare	Ls
Acanthiza pusilla	Brown Thornbill	Rare	Lhs
Anas castanea	Chestnut Teal	Uncommon	Lhs
**Turdus merula*	Common Blackbird	Uncommon	hs
**Acridotheres tristis*	Common Myna	Common	hs
**Sturnus vulgaris*	Common Starling	Common	hs
Ocyphaps lophotes	Crested Pigeon	Uncommon	Lhs
Platycercus eximius	Eastern Rosella	Uncommon	Lhs
**Carduelis carduelis*	European Goldfinch	Uncommon	hs
Petroica phoenicea	Flame Robin	Uncommon	Rhs
Eolophus roseicapillus	Galah	Uncommon	Lhs
Cisticola exilis	Golden-headed Cisticola	Uncommon	HLhs
Cracticus torquatus	Grey Butcherbird	Uncommon	Lhs
Rhipidura fuliginosa	Grey Fantail	Common at times	Lhs
Megalurus gramineus	Little Grassbird	Uncommon	HLhs
Corvus mellori	Little Raven	Uncommon	Lhs
Grallina cyanoleura	Magpie-lark	Common	Lhs
Vanellus miles	Masked Lapwing	Uncommon	Lhs
Falco cenchroides	Nankeen Kestrel	Rare	Lhs
Manorina melanocephala	Noisy Miner	Uncommon	Lhs
Anas supoerciliosa	Pacific Black Duck	Uncommon	Lhs
Trichoglossus haematodus	Rainbow Lorikeet	Uncommon	Lhs
Anthochaera carunculata	Red Wattlebird	Uncommon	Lhs
**Alauda arvensis*	Skylark	Common	hs
Pardalotus punctatus	Spotted Pardalote	Rare	Lhs
**Streptopelia chinensis*	Spotted Turtle-Dove	Common	Hs
Threskiornis spinicollis	Straw-necked ibis	Common	Lhs
Cacatua galerita	Sulphur-crested Cockatoo	Uncommon	Lhs
Malurus cyaneus	Superb Fairy-wren	Rare	Lhs
Hirundo neoxena	Welcome Swallow	Uncommon	Lhs
Sericornis frontalis	White-browed Scrubwren	Rare	Lhs
Egretta novaehollandiae	White-faced Heron	Rare	Lhs
Rhipidura leucophrys	Willy Wagtail	Uncommon	Lhs
Acanthiza chrysorrhoa	Yellow-rumped Thornbill	Uncommon	Lhs
MAMMALS			
Rattus lutreolus ssp. Lutreolus	Swamp Rat	Uncommon	
Trichosurus vulecula	Common Brushtail Possum	Rare	
INTRODUCED MAMMALS			
**Felis catus*	Feral Cat	Common	
**Mus muscus*	House Mouse	Uncommon	
**Rattus rattus*	Black Rat	Uncommon	
**Vulpes vulpes*	Red Fox	Common	

Fauna Appendix 4. Fauna records during the current assessment: Property Records

Cranbourne North (Stage 2) study area assessment period: 20/3/2009 to 17/5/2009. Fauna taxa recorded incidentally and during targeted searches for threatened searches from within the study area during this survey by Malcolm Legg of Mal's Ecological and Environmental Services.

This Appendix presents records for individual properties within the study area.

Common Name	Scientific Name	Frequency status within site.	Type of record
Site 1- Thompson Road- Road Reserve			
AMPHIBIANS			
Common Froglet	*Crinia signifera*	Uncommon	Lh
BIRDS			
Australian Magpie	*Gymnorhina tibicen*	Common	Lhs
Australian Raven	*Corvus coronoides*	Common	Lhs
Brown Thornbill	*Acanthiza pusilla*	Rare	Lhs
Common Blackbird	**Turdus merula*	Uncommon	hs
Common Myna	**Acridotheres tristis*	Common	hs
Common Starling	**Sturnus vulgaris*	Common	hs
Crested Pigeon	*Ocyphaps lophotes*	Uncommon	Lhs
Eastern Rosella	*Platycercus eximius*	Uncommon	Lhs
Galah	*Eolophus roseicapillus*	Uncommon	Lhs
Grey Butcherbird	*Cracticus torquatus*	Uncommon	Lhs
Magpie-lark	*Grallina cyanoleura*	Common	Lhs
Nankeen Kestrel	*Falco cenchroides*	Rare	Lhs
Noisy Miner	*Manorina melanocephala*	Uncommon	Lhs
Pacific Black Duck	*Anas supoerciliosa*	Uncommon	Lhs
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon	Lhs
Red Wattlebird	*Anthochaera carunculata*	Uncommon	Lhs
Spotted Pardalote	*Pardalotus punctatus*	Rare	Lhs
Spotted Turtle-Dove	**Streptopelia chinensis*	Common	Hs
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon	Lhs
Superb Fairy-wren	*Malurus cyaneus*	Rare	Lhs
Welcome Swallow	*Hirundo neoxena*	Uncommon	Lhs
White-browed Scrubwren	*Sericornis frontalis*	Rare	Lhs
Willy Wagtail	*Rhipidura leucophrys*	Uncommon	Lhs
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Uncommon	Lhs
MAMMALS			
INTRODUCED MAMMALS			
Red Fox	**Vulpes vulpes*	Common	sl

Site 3- 1715 Thompson Road

AMPHIBIANS			
Common Froglet	*Crinia signifera*	Uncommon	Lh
BIRDS			
Australian Magpie	*Gymnorhina tibicen*	Common	Lhs
Australian Raven	*Corvus coronoides*	Common	Lhs
Australian White Ibis	*Threskiornis molucca*	Common	Lhs
Common Blackbird	**Turdus merula*	Uncommon	hs
Common Myna	**Acridotheres tristis*	Common	hs
Common Starling	**Sturnus vulgaris*	Common	hs
Crested Pigeon	*Ocyphaps lophotes*	Uncommon	Lhs
European Goldfinch	*Carduelis carduelis*	Uncommon	hs
Flame Robin	*Petroica phoenicea*	Uncommon	Rhs
Galah	*Eolophus roseicapillus*	Uncommon	Lhs
Golden-headed Cisticola	*Cisticola exilis*	Uncommon	HLhs
Grey Butcherbird	*Cracticus torquatus*	Uncommon	Lhs
Little Grassbird	*Megalurus gramineus*	Uncommon	HLhs
Magpie-lark	*Grallina cyanoleura*	Common	Lhs
Masked Lapwing	*Vanellus miles*	Uncommon	Lhs
Nankeen Kestrel	*Falco cenchroides*	Rare	Lhs
Noisy Miner	*Manorina melanocephala*	Uncommon	Lhs
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon	Lhs
Skylark	**Alauda arvensis*	Common	hs
Spotted Turtle-Dove	**Streptopelia chinensis*	Common	Hs
Straw-necked ibis	*Threskiornis spinicollis*	Common	Lhs
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon	Lhs
Welcome Swallow	*Hirundo neoxena*	Uncommon	Lhs
Willy Wagtail	*Rhipidura leucophrys*	Uncommon	Lhs
MAMMALS			
Common Brushtail Possum	*Trichosurus vulecula*	Rare	Lhs
INTRODUCED MAMMALS			
Black Rat	**Rattus rattus*	Uncommon	t
House Mouse	**Mus musculus*	Uncommon	t
Red Fox	**Vulpes vulpes*	Common	sl

Site 4- Glasscocks Road –Road Reserve			
AMPHIBIANS			
Common Froglet	*Crinia signifera*	Common	Lh
BIRDS			
Australasian Grebe	*Tachybaptus novaehollandiae*	Uncommon	Lhs
Australian Magpie	*Gymnorhina tibicen*	Common	Lhs
Australian Raven	*Corvus coronoides*	Common	Lhs
Australian Wood Duck	*Chenonetta jubata*	Common	Lhs
Black Swan	*Cygnus atratus*	Rare	Ls
Chestnut Teal	*Anas castanea*	Uncommon	Lhs
Common Blackbird	**Turdus merula*	Common	hs
Common Myna	**Acridotheres tristis*	Common	hs
Common Starling	**Sturnus vulgaris*	Common	hs
Crested Pigeon	*Ocyphaps lophotes*	Uncommon	lhs
Eastern Rosella	*Platycercus eximius*	Common	Lhs
Galah	*Eolophus roseicapillus*	Uncommon	Lhs
Grey Butcherbird	*Cracticus torquatus*	Uncommon	Lhs
Magpie-lark	*Grallina cyanoleura*	Common	Lhs
Masked Lapwing	*Vanellus miles*	Uncommon	Lhs
Noisy Miner	*Manorina melanocephala*	Common	Lhs
Pacific Black Duck	*Anas supoerciliosa*	Uncommon	Lhs
Rainbow Lorikeet	*Trichoglossus haematodus*	Common	Lhs
Spotted Turtle-Dove	**Streptopelia chinensis*	Common	Hs
Sulphur-crested Cockatoo	*Cacatua galerita*	Common	Lhs
Welcome Swallow	*Hirundo neoxena*	Common	Lhs
White-faced Heron	*Egretta novaehollandiae*	Rare	Lhs
Willy Wagtail	*Rhipidura leucophrys*	Uncommon	Lhs
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Uncommon	Lhs
MAMMALS			
INTRODUCED MAMMALS			
Red Fox	**Vulpes vulpes*	Common	sl
Feral Cat	**Felis catus*	Common	t

Site 5- 1115- Glasscocks Road

AMPHIBIANS			
Common Froglet	*Crinia signifera*	Uncommon	Lh
BIRDS			
Australian Magpie	*Gymnorhina tibicen*	Common	Lhs
Australian Raven	*Corvus coronoides*	Common	Lhs
Common Blackbird	**Turdus merula*	Uncommon	hs
Common Myna	**Acridotheres tristis*	Common	hs
Common Starling	**Sturnus vulgaris*	Common	hs
Galah	*Eolophus roseicapillus*	Uncommon	Lhs
Grey Butcherbird	*Cracticus torquatus*	Uncommon	Lhs
Magpie-lark	*Grallina cyanoleura*	Common	Lhs
Nankeen Kestrel	*Falco cenchroides*	Rare	Lhs
Noisy Miner	*Manorina melanocephala*	Uncommon	Lhs
Spotted Turtle-Dove	**Streptopelia chinensis*	Common	hs
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon	Lhs
Welcome Swallow	*Hirundo neoxena*	Uncommon	Lhs
Willy Wagtail	*Rhipidura leucophrys*	Uncommon	Lhs
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Uncommon	Lhs
MAMMALS			
Swamp Rat	*Rattus lutreolus ssp. Lutreolus*	Uncommon	RtI
INTRODUCED MAMMALS			
Black Rat	**Rattus rattus*	Uncommon	t
House Mouse	**Mus muscus*	Uncommon	ts
Red Fox	**Vulpes vulpes*	Common	sI

Site 7- 675 Berwick Cranbourne Road

AMPHIBIANS			
Common Froglet	*Crinia signifera*	Uncommon	Lh
BIRDS			
Australian Magpie	*Gymnorhina tibicen*	Common	Lhs
Australian Raven	*Corvus coronoides*	Common	Lhs
Common Blackbird	**Turdus merula*	Uncommon	hs
Common Myna	**Acridotheres tristis*	Common	hs
Common Starling	**Sturnus vulgaris*	Common	hs
Galah	*Eolophus roseicapillus*	Uncommon	Lhs
Grey Butcherbird	*Cracticus torquatus*	Uncommon	Lhs
Little Raven	*Corvus mellori*	Uncommon	Lhs
Magpie-lark	*Grallina cyanoleura*	Common	Lhs
Masked Lapwing	*Vanellus miles*	Uncommon	Lhs
Nankeen Kestrel	*Falco cenchroides*	Rare	Lhs
Noisy Miner	*Manorina melanocephala*	Uncommon	Lhs
Skylark	**Alauda arvensis*	Common	hs
Spotted Turtle-Dove	**Streptopelia chinensis*	Common	hs
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon	Lhs
Welcome Swallow	*Hirundo neoxena*	Uncommon	Lhs
Willy Wagtail	*Rhipidura leucophrys*	Uncommon	Lhs
MAMMALS			
INTRODUCED MAMMALS			
Red Fox	**Vulpes vulpes*	Common	sl

Site 8- 695 Berwick/Cranbourne Road

BIRDS			
Australian Magpie	*Gymnorhina tibicen*	Common	Lhs
Australian Raven	*Corvus coronoides*	Common	Lhs
Common Myna	**Acridotheres tristis*	Common	hs
Common Starling	**Sturnus vulgaris*	Common	hs
Galah	*Eolophus roseicapillus*	Uncommon	Lhs
Little Raven	*Corvus mellori*	Uncommon	Lhs
Magpie-lark	*Grallina cyanoleura*	Common	Lhs
Masked Lapwing	*Vanellus miles*	Uncommon	Lhs
Nankeen Kestrel	*Falco cenchroides*	Rare	Lhs
Noisy Miner	*Manorina melanocephala*	uncommon	Lhs
Skylark	**Alauda arvensis*	Uncommon	hs
Spotted Turtle-Dove	**Streptopelia chinensis*	Uncommon	hs
Sulphur-crested Cockatoo	*Cacatua galerita*	uncommon	Lhs
Welcome Swallow	*Hirundo neoxena*	Uncommon	Lhs
Willy Wagtail	*Rhipidura leucophrys*	Uncommon	Lhs
MAMMALS			
INTRODUCED MAMMALS			
Red Fox	**Vulpes vulpes*	Common	sl

Site 9- 705 Berwick/ Cranbourne Road

BIRDS			
Australian Magpie	*Gymnorhina tibicen*	Common	Lhs
Australian Raven	*Corvus coronoides*	Common	Lhs
Common Blackbird	**Turdus merula*	Uncommon	hs
Common Myna	**Acridotheres tristis*	Common	hs
Common Starling	**Sturnus vulgaris*	Common	hs
Crested Pigeon	*Ocyphaps lophotes*	Uncommon	Lhs
Eastern Rosella	*Platycercus eximius*	Uncommon	Lhs
Galah	*Eolophus roseicapillus*	Uncommon	Lhs
Grey Butcherbird	*Cracticus torquatus*	Uncommon	Lhs
Grey Fantail	*Rhipidura fuliginosa*	Common at times	Lhs
Magpie-lark	*Grallina cyanoleura*	Common	Lhs
Noisy Miner	*Manorina melanocephala*	Uncommon	Lhs
Rainbow Lorikeet	*Trichoglossus haematodus*	Uncommon	Lhs
Spotted Pardalote	*Pardalotus punctatus*	Uncommon	Lhs
Spotted Turtle-Dove	**Streptopelia chinensis*	Common	Hs
Sulphur-crested Cockatoo	*Cacatua galerita*	Uncommon	Lhs
Superb Fairy-wren	*Malurus cyaneus*	Rare	Lhs
Welcome Swallow	*Hirundo neoxena*	Uncommon	Lhs
Willy Wagtail	*Rhipidura leucophrys*	Uncommon	Lhs
Yellow-rumped Thornbill	*Acanthiza chrysorrhoa*	Uncommon	Lhs
MAMMALS			
Common Brushtail Possum	*Trichosurus vulecula*	Uncommon	LhsI
INTRODUCED MAMMALS			
Feral Cat	**Felis catus*	Common	t
Red Fox	**Vulpes vulpes*	Common	sI

*Denotes introduced species

Fauna Appendix 5. Significant Fauna Species in VFD and EPBC Databases

Fauna species detected within five kilometres of the study area boundary on DSE's Victorian Fauna Database (VFD) (DSE 2005a). Species listed on EPBC Protected Matters Search Tool also included, except for Listed Marine Species (not relevant). Habitat/Comments column also gives indication of location and year of records lodged with VFD.

FFG	EPBC	DSE	Mig	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)
		v		S, R2	Australasian Shoveler	*Anas rhynchotis*	Anatidae	The Australasian Shoveler occurs mainly on large well vegetated wetlands and lakes, occasionally including areas with saline waters. Populations are found in higher numbers on permanent, well-vegetated freshwater swamps with areas of open water (Rogers 1990). This species nest in grass nests on the ground, usually in dense cover and near water. (Pizzey and Knight 2007).	Moderate	AVW	2.04%	9
L	VU	v		S, R2	Australian Grayling	*Prototroctes maraena*	Retropinnidae	This species only spends part of its life in freshwater streams, Australian Graylings migrate between freshwater streams and the ocean (Lake 1971; Bishop & Bell 1978). Streams where this species occur tend to be clear with gravel bottoms and a variety of in stream habitat such as pools and riffles (Berra 1982). The upstream migration of this species has been effectively terminated in some rivers by dams (e.g. Tallowa Dam) (Bishop & Bell 1978).	Low	EPBC/AVW	0.45%	2
	VU, m	C	N, R2, R3	Australian Painted Snipe	*Rostratula australis*	Rostratulidae	Has been nominated to be listed as vulnerable under the EPBC Act. Migratory. Species or species habitat may occur within area. Uncommon summer visitors to Vic from farther north in Aust. They usually occur in the lowlands on shallow freshwater swamps with emergent vegetation, and flooded saltmarshes. They do not form flocks but loose groups are sometimes seen, either along or with Latham's Snipe. Painted Snipe forage on mud among dense swamp vegetation. Their nests are depressions on elevated areas of dry mud surrounded by shallow water and dense vegetation.	Low	EPBC		
	m	C	S, R2, R3	Australian Painted Snipe	*Rostratula benghalensis s. lat.*	Rostratulidae	Has been nominated to be listed as vulnerable under the EPBC Act. Migratory. Species or species habitat may occur within area. Uncommon summer visitors to Vic from farther north in Aust. They usually occur in the lowlands on shallow freshwater swamps with emergent vegetation, and flooded saltmarshes. They do not form flocks but loose groups are sometimes seen, either along or with Latham's Snipe. Painted Snipe forage on mud among dense swamp vegetation. Their nests are depressions on elevated areas of dry mud surrounded by shallow water and dense vegetation.	Low	EPBC		
L		v		S, R2	Baillon's Crake	*Porzana pusilla*	Rallidae	This species is a summer migrant to Victoria. It inhabits freshwater wetlands and floodwaters usually containing floating plants or tall emergent vegetation. The Baillon's Crake feeds in shallow water, mud and emergent aquatic plants. It has been found to nest in clumps or tussocks of vegetation surrounded by water.	Moderate	AVW	0.22%	1
		v		S, R1, R2	Black Falcon	*Falco subniger*	Falconidae	The Black Falcon has a stronghold is inland Australia. Most Victorian records come from the lowlands and only occasionally from the foothills. It occurs mainly over croplands, grasslands and wooded farmlands. To catch flushed prey, they sweep low over croplands and grasslands and are often attracted by smoke from grassfires and late-summer burning off. This species nests in trees in old stick-nests of other birds.	Low	AVW	0.22%	1
		m		R1, R2, R3	Black-faced Monarch	*Monarcha melanopsis*	Dicruridae	Black-faced Monarch is a summer migrant to the south-east coastal areas. It is found in woodland, coastal scrub, damp gullies and occasionally open woodlands.	Low	EPBC		

FFG	EPBC	DSE	Mig	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)
L		e		S, R2	Blue-billed Duck	*Oxyura australis*	Anatidae	This species inhabits deep, permanent, well-vegetated swamps, but as times (especially in winter) may occur in large numbers on large open wetlands(Pizzey and Knight 2007). The Blue-billed Duck catches food while diving or occasionally by feeding from the water surface. Their nests are built on trampled swamp vegetation around the base of established stands of reeds/rushes, often over water or on small islands (Rogers 1990).	Moderate	AVW	2.27%	10
		n		R1, R2	Brown Quail	*Coturnix ypsilophora*	Phasianidae	The Brown Quail is widespread in Victoria, however suitable habitats are quite localised. It has been reported from grass and sedge flats, often adjacent to rivers and swamps. Along major rivers in northern Victoria they occur in grassy River Red Gum forests and in eastern Victoria they inhabit wet woodlands and forests containing grasses, sword-sedges and Gahnia. It has also been observed in bracken, Lucerne pastures, and potato crops. It feeds and nests on the ground.	Moderate	AVW	0.22%	1
		n			Cape Barron Goose	*Cereopsis novaehollandiae*	Anatidae	Cape Barron Goose occurs on grassland or terrestrial habitats mostly on offshore islands and nearby mainland areas. The species breeds on the islands and migrates to the mainland and large islands in summer. Birds tend to congregate on grassland and pasture and occasionally intertidal flats to feed. Favourable habitats created by agriculture have resulted in increasing b=numbers in recent decades since hunting has ceased (Higgins 1999).	High	current assessment		
	m		J, C	R2, R3	Cattle Egret	*Ardea ibis*	Ardeidae	Cattle Egret is a migratory species. The species has a high likelihood of occurrence within the study area. Cattle Egret occurs in many types of wetlands; from tidal flats in estuaries and bays to the margins of inland lakes, swamps and rivers (Pizzey and Knight 2007). They also use farm dams, mangroves, flooded areas, and artificial wetlands created by irrigation. Cattle Egret are often seen foraging away from water in crops and pasture, they build stick-nests in trees, usually surrounded by water or dense treed cover, or occasionally in reed-beds (O'Brien 1990). The species nests colonially, often with other waterbirds. Egrets are threatened due to restricted nesting sites.	High	EPBC		
L	VU	v		N, S, R2	Dwarf Galaxias	*Galaxiella pusilla*	Galaxiidae	Occurs in vegetated margins of slow-flowing coastal creeks, drains and swamps. Rare in Victoria, however more abundant in the south-east of the state in Mornington Peninsula & Western Port areas (Museum Victoria 2006).	Moderate	EPBC/AVW	0.22%	1
		n		S, R2	Eastern Curlew	*Numenius madagascariensis*	Scolopacidae	This species is a summer migrants to Victoria, from Siberian breeding grounds. Small numbers will over winter in coastal areas. During summer they occur regularly on tidal mudflats in Corner Inlet, Western Port and Port Phillip Bay. Small numbers occur elsewhere on coastal mudflats and, rarely, birds appear on muddy edges of inland saline lakes. They feed by probing in mudlfats, in rock pools and among seagrass and roost on spits, islets or in saltmarshes.	Low	AVW	0.22%	1
L	m	v	J, C	S, R2, R3	Eastern Great Egret	*Ardea modesta*	Ardeidae	Eastern Great Egret is widespread in Australia and has been observed in a wide range of wetland habitats including swamps and marshes; margins of rivers and lakes; damp or flooded grasslands, pastures or agricultural lands; reservoirs; sewage treatment ponds; drainage channels; salt pans and salt lakes; salt marshes; estuarine mudflats, tidal streams; mangrove swamps; coastal lagoons; and offshore reefs (DEWHA 2009).	High	AVW	0.45%	2
	m		J, C, R	R1, R2, R3	Fork-tailed Swift	*Apus pacificus*	Apodidae	The Fork-tailed Swift is a migratory species occurring throughout Australia. This species is almost entirely aerial.	High	EPBC		
L		e		S, R2	Freckled Duck	*Stictonetta naevosa*	Anatidae	This species can occur on fresh water swamps, creeks, ponds, dams, reservoirs, sewage ponds and other ephemeral wetlands. It needs a thick cover of vegetation such as bulrush, lignum or tea-tree for nesting (Rogers 1990).	Moderate	AVW	0.22%	1

FFG	EPBC	DSE	Mig	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)
		n		S, R2	Glossy Ibis	*Plegadis falcinellus*	Threskiornithidae	This species is a partial summer migrants to Victoria from northern Australia. They inhabit vegetated or muddy margins of freshwater wetlands and nearby grasslands and pastures. They forage in shallow water or mud on the margins of wetlands and occasionally from low vegetation and nest colonially, usually with other ibises. They build stick-nests in trees and shrubs low over water, in reed beds or on islands.	Low	AVW	0.22%	1
L	CR	e		N, S, R2	Golden Sun Moth	*Synemon plana*	Castniidae	It is generally found in temperate grasslands and open grassy woodlands where the ground layer is dominated by native Wallaby Grass. Optimal habitat is dominated by wallaby grasses Austrodanthonia spp with an open tussock structure (Dwyer 2000). It has also been recorded in grasslands dominated by Kangaroo Grass *Themeda triandra* and exotic dominated grasslands (i.e. Chilean Needlegrass).	Low	EPBC/AVW	0.22%	1
L		e		S, R2	Grey-crowned Babbler	*Pomatostomus temporalis*	Pomatostomidae	This species inhabit dry forests and woodlands, roadside trees, and wooded farmlands usually associated with river floodplains. The Grey-crowned babbler feed in leaf and branch litter, bark and branch crevices and from foliage of shrubs and trees. They live in groups and build a series of large domed nests in shrubs or small trees.	Low	AVW	0.22%	1
L	VU			N, S, R2	Grey-headed Flying-fox	*Pteropus poliocephalus*	Pteropodidae	The Grey-headed Flying-fox occurs in various forest habitats in close proximity to plentiful supplies of nectar producing flowers and fleshy fruit. Large camps can be found roosting in the branches of tall trees in a range of vegetation, including rainforest patches, Melaleuca stands, mangroves, riparian woodland and modified vegetation in urban areas (Richards 1983).	Low	EPBC		
L	VU	e		N, R2	Growling Grass Frog	*Litoria raniformis*	Hylidae	The species often inhabitant water bodies with a diverse assemblage of aquatic vegetation, including emergent species such as sedges (Gahnia spp.), submergent species such as curly pondweed (Potamageton spp.), floating species such as water ribbon (Triglochin spp.) and filamentous algae (Hamer and Organ 2006, Heard et al. 2004). The aquatic vegetation provides sites for male frogs to call from, sites for eggs to be deposited and relatively safe development, and food and shelter for tadpoles. Dense submergent vegetation is especially important to protect eggs and tadpoles from predation (Heard et al. 2004).	Moderate	EPBC		
		v		S, R2	Hardhead	*Aythya australis*	Anatidae	Hardheads inhabit deep to shallow wetlands with open water and fringing emergent vegetation (Pizzey and Knight 2007). The species feeds by diving in deep water and occasionally by dabbling just under the water surface (Rogers 1990). Nests are built in thick vegetation (e.g. reeds, lignum, cumbungi), usually over water (Rogers 1990, Halse et al. 2005). These birds are most common in the wetland systems of inland Australia (Halse et al. 2005). Birds do visit Victoria from these areas in spring and summer, returning as the northern wetlands is replenished by rain (Halse et al. 2005). However, some birds are present in Victoria all year round depending on the suitability of the wetland (Pizzey and Knight 2007).	High	AVW	2.50%	11
L	EN	c		N, S, R2	Helmeted Honeyeater	*Lichenostomus melanops cassidix*	Lycaenidae	The Helmeted Honey-eater inhabits riparian Manna Gum, Swamp Gum forests over dense understorey of Prickly Tea-tree. They nest in colonies along creeks and their nests are built in low shrubs. This species is restricted to forest remnants.	Low	AVW	0.22%	1
L		c		S, R2	Intermediate Egret	*Ardea intermedia*	Ardeidae	The Intermediate Egret occurs in the shallows of mainly grassy inland wetlands, flooded pastures or grasslands. They only occasionally visit coastal wetlands and are generally rare in Victoria. They are sometimes seen foraging in pastures with grazing cattle. This species builds platform nests which are built in trees in riverine forest, swamp woodland and mangroves (Pizzey and Knight 2007).	Moderate	AVW	0.22%	1

FFG	EPBC	DSE	Mig	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)
L		r		S, R2	Large Ant Blue	*Acrodipsas brisbanensis*	Lycaenidae	The caterpillar of this species appears to spend it's entire life within an ant nest and is suspected of being carnivorous, eating the ants. Adult butterflies tend to fly high near the tops of trees (Braby, 2000) . They are mostly found around coastal areas.	Low	AVW	0.22%	1
		n		S, R2	Latham's Snipe	*Gallinago hardwickii*	Scolopacidae	Migratory. Species or species habitat may occur within area. Summer migrants to Victoria from breeding grounds in Japan. In Victoria this species is widely distributed in a range of habits including heavily vegetated freshwater swamps, and pools or ditches in heaths or subalpine herblands. Also occurs in small ephemeral wetlands such as wet depressions after floods recede. Generally roosts in thick vegetation during the day, sometimes under shrubs away from wetlands, and will feed in swamps at night. They are occasionally seen to be feeding during the day. This species feeds by probing in soft mud and rarely move far from concealing vegetation.	High	AVW	2.27%	10
	VU			N, R2	Long-nosed Potoroo (SE mainland)	*Potorous tridactylus tridactylus*	Potoroidae	The Long-nosed Potoroo is most commonly found in heathy coastal vegetation, dry and wet sclerophyll forests with a dense understorey with a sandy loamy soil. Their habitat tends to have some open areas with a grassy understorey for foraging. Preferred habitat has an understorey that may feature grass-trees, sedges, ferns or heath, or low shrubs of tea-trees or melaleucas (Johnson, 1995).	Low	EPBC		
L		n		S, R2	Magpie Goose	*Anseranas semipalmata*	Anseranatidae	Most of the populations of this species has been re-introduced. They breed colonially and build platform nests over water, usually among tall rushes or reed beds. The Magpie Goose feeds by digging in mud or by up-ending in shallow water, they have also been see grazing and digging well away from water.	Low	AVW	0.22%	1
		v		S, R2	Musk Duck	*Biziura lobata*	Anatidae	Usually seen in small numbers on the deep waters of well vegetated fresh to saline lakes, swamps and occasionally shallow inlets and bays. Nests formed in low vegetation in areas sheltered by surrounding vegetation(Pizzey and Knight 2007).	Moderate	AVW	0.45%	2
L		v		S, R2	New Holland Mouse	*Pseudomys novaehollandiae*	Muridae	The New Holland Mouse is found in dry coastal heath and heathy sclerophyll forest where understorey is greater than 10 years old. They are nocturnal, gregarious, and shelters in burrow systems up to several metres long.	Low	AVW	0.22%	1
		n		S, R2	Pacific Gull	*Larus pacificus pacificus*	Laridae	The Pacific Gull is confined to the coast where flocks occur on intertidal mudflats and nearby rubbish tips in Port Phillip Bay, Western Port and Corner Inlet, with smaller numbers elsewhere on estuaries, along beaches and on other intertidal habitats. This species breeds mainly on islands in Bass Strait and off Tasmania. Some smaller numbers breed on islands off Wilsons Promontory. Their nests are built on the ground on the tops of steep-sided islands.	Low	AVW	1.36%	6
L		v		S, R2	Painted Honeyeater	*Grantiella picta*	Meliphagidae	The Painted Honeyeater is a summer migrants to Victoria. They are generally found to inhabit box-ironbark, Broad-leaved Peppermint and Red Stringybark forests and box-buloke woodlands in the northern foothills of the great Divide. May also occur in Red Ironbark, Red Box forests in southern Victoria. They are occasionally found along Murray River valley to Hattah-Kulkyne NP where they inhabit Black Box woodlands. This species is usually found in open stands of old eucalypts that are infested with mistletoes.	Low	AVW	0.22%	1
		n		S, R2	Pied Cormorant	*Phalacrocorax varius*	Phalacrocoracidae	This species is most often found along the coast, however are known to use inland wetlands including billabongs, deep and open swamps and rivers (large freshwater and saline wetlands). They nest in colonies, building platforms nests in mangroves or other trees (Pizzey and Knight 2007).	High	AVW	0.45%	2

FFG	EPBC	DSE	Mig	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)
	m		J	R1, R2, R3	Rainbow Bee-eater	*Merops ornatus*	Meropidae	The Rainbow Bee-eater is a migratory species. It occurs in many types of habitat including woodland, shrubland, semi-cleared land and farmland, however it mainly occurs where eucalyptus species are dominant (Higgins 1999). It is almost entirely insectivorous and mostly occurs near to permanent water (Higgins 1999).	Low	EPBC		
	EN, m		J	N, R2, R3	Regent Honeyeater	*Anthochaera phrygia*	Meliphagidae	Migratory. Species or species habitat may occur within area. Occurs mainly in box-ironbark forests and woodlands north of the Great Divide. There are historical and recent isolated records from drier parts of south eastern Victoria. Highly nomadic, their movements are determined by the flowering of eucalypts.	Low	EPBC		
		v		S, R2	Royal Spoonbill	*Platalea regia*	Threskiornithidae	The Royal Spoonbill inhabits the shallow parts of fresh and saline wetlands; these birds are gregarious in small flocks. They are mostly common on intertidal mudflats in coastal bays. Their stick-nests are built in reeds, shrubs or trees, singly or in loose colonies and are often seen with other species (Rogers 1990).	High	AVW	0.90%	4
	m			R2, R3	Rufous Fantail	*Rhipidura rufifrons*	Dicruridae	The Rufous Fantail is migratory and can be found in a variety of habitats including swampy woodland, rainforest, mangrove, dense wet forests. It is generally found where there is dense shade and thick understorey shrubs and bushes and is often seen close to the ground. , It can be found in less dense habitats during migration and has been seen in many urban sites (Australian Museum 2008).	Moderate	EPBC		
	m			R2, R3	Satin Flycatcher	*Myiagra cyanoleuca*	Dicruridae	The Satin Flycatcher is a migratory bird and occurs in Victoria during the spring/summer months. It is generally found in wet dense forests and gullies (Australian Museum 2008).	Moderate	EPBC		
	EN			N, R2	Smoky Mouse	*Pseudomys fumeus*	Muridae	The Smoky Mouse occurs mainly in in dry sclerophyll forest on ridges with heath and tussock-grass understorey, coastal heath and subalpine heath. It shelters communally in a nest on the surface of the ground. It has a patchy distribution and may have a successional pattern of occurrence relating to time since fire.	Low	EPBC		
	EN	n		N, S, R2	Southern Brown Bandicoot	*Isoodon obesulus obesulus*	Peramelidae	The Southern Brown Bandicoot is found in heathy forest, heath and coastal scrub. It shelters in a nest of vegetation beneath dense cover.	Low	EPBC/AVW	2.72%	12
		v		S, R2	Southern Toadlet	*Pseudophryne semimarmorata*	Myobatrachidae	The Southern Toadlet can be found in dry forest, woodland, shrubland, grassland and heaths. It shelters under leaf litter and other debris in moist soaks and depressions. Their eggs are spawned in shallow burrows under organic litter in low areas close to water (Hero et al. 1991).	High	AVW	11.59%	51
	EN			N, R2	Spot-tailed Quoll (south-eastern mainland population)	*Dasyurus maculatus maculatus (SE mainland population)*	Dasyuridae	The Spot-tailed quoll is found in many habitats including rainforest, wet and dry sclerophyll forest, coastal heath and scrub.	Low	EPBC		
		n		S, R2	Spotted Harrier	*Circus assimilis*	Accipitridae	This species occurs in open grasslands, open shrublands, saltbush, open woodlands, crops and similar low vegetation that allows hunting. Their stick nests are built in low trees(Pizzey and Knight 2007)..	Moderate	AVW	0.45%	2
L	VU	e		N, S, R2	Superb Parrot	*Polytelis swainsonii*	Psittacidae	This species is generally only found in the Upper Murray Valley, mainly in the riverine forests and woodlands of Barmah Forest in Victoria. All other sightings have been made along or within 10 km of the Murray, Ovens and Goulburn Rivers. Their nests located in hollows of very large riparian trees in River Red Gum forests. They feed mainly in Black Box, Grey Box, Yellow Box woodlands and sometimes in open woodland. They forage in their nesting forests and may also forage on the ground, in eucalypts and in mistletoes.	Low	AVW	0.22%	1

FFG	EPBC	DSE	Mig	Regional Significance	Common Name	Scientific Name	Family Name	Habitat Notes	Likelihood of Occurrence	Database	Freq (AVW only)	NumSite (AVW only)
L	EN	e		N, S, R1, R2	Swift Parrot	*Lathamus discolor*	Psittacidae	The Swift Parrot is a winter migrant to Victoria (Swift Parrot Recovery Team 2001). Arriving from their breeding areas in Tasmania, however small numbers of non-breeding birds may remain here during summer (Higgins 1999, Swift Parrot Recovery Team 2001). They are nomadic, and follow the flowering of trees and psyllid infestations. In Victoria their distribution is centred on box-ironbark forests, but they are often seen in town parks and occur sporadically elsewhere in dry forests, dry woodlands and wooded farmlands but are seldom seen in treeless areas, rainforests or wet forests(Higgins 1999, Pizzey and Knight 2007). Feed mainly in winter-flowering plants, especially Red Ironbarks and ornamental trees and shrubs (Higgins 1999, Swift Parrot Recovery Team 2001).	Moderate	EPBC/AVW	0.22%	1
		n		S, R2	Whiskered Tern	*Chlidonias hybridus*	Laridae	This is mainly a summer migrant to Victoria, although some remain here over winter. They inhabit shallow freshwater swamps and fresh or brackish lakes, favouring areas with emergent vegetation. The Whiskered Tern build nests on the water in colonies among flooded or emergent vegetation.	Low	AVW	0.45%	2
L	m	v	C	S, R2, R3	White-bellied Sea-Eagle	*Haliaeetus leucogaster*	Accipitridae	The White-bellied Sea-eagle mainly occurs along the coast, but may travel along some inland rivers and lakes.	Low	AVW	0.45%	2
	m		J, C, R	R2, R3	White-throated Needletail	*Hirundapus caudacutus*	Apodidae	White Throated Needletail is a migratory species. It is almost entirely aerial and occurs over many types of habitat (Pizzey and Knight 2007).	High	EPBC		
	VU			N, R2	Yarra Pygmy Perch	*Nannoperca obscura*	Percichthyidae	The Yarra Pygmy Perch occurs in both fresh and brackish water. It has mainly been found in slow moving or still water bodies with large amounts of aquatic (both emergent and submergent) vegetation and many logs, snags and rocks.	Low	EPBC		

Table Key

Last record. Year fauna taxa was last recorded.

No. recs Number of sites in which the species is recorded in

EPBC Species listed as threatened in Australia under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC)

EX	Extinct
CR	Critically Endangered
EN	Endangered
VU	Vulnerable
CD	Conservation Dependent
m	Migratory species

Mig. Birds listed under bilateral migratory bird agreements listed below:

J	JAMBA (Japan-Australia Migratory Bird Agreement 1974)
C	CAMBA (China-Australia Migratory Bird Agreement 1986)
R	ROKAMBA (Republic of Korea-Australia Migratory Bird Agreement 2006)
CMS	Convention on Migratory Species or Bonn Convention. Birds listed under the Agreement on the Conservation of Albatrosses and Petrels (ACAP) 2006

Vic. cons. status Conservation status under DSE's *Advisory List Of Threatened Vertebrate Fauna in Victoria 2007* (DSE 2007)

ex	Extinct
r	Regionally Extinct
w	Extinct in the Wild
c	Critically Endangered
e	Endangered
v	Vulnerable
n	Near Threatened
d	Data Deficient
*	introduced species. Not listed in the advisory list above.

FFG Status under the Flora and Fauna Guarantee Act 1988 (FFG)

L	species listed as threatened
N	species nominated for listing as threatened but has not yet completed the listing process
I	Invalid or ineligible listing

Sig. Biological Significance

This is a rating of the contribution that biological assets of a site or species make towards the conservation of Australia's native biodiversity.

N	National	Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* as extinct, extinct in the wild, critically endangered, endangered or vulnerable.
S1	State	Species listed as Threatened under Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988* Species listed as extinct, critically endangered, endangered, vulnerable in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007)
R1	Regional	Regional according to Table 5. *Rare and restricted species in the greater Gippsland Plains* in Radford and Bennett (2005) – birds only.
R2	Regional	Regional according to Malcolm Legg (pers. comm.). Region is defined as the Mornington Peninsula and surrounding Western Port area.
R3	Regional	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007) Birds listed under migratory bird agreements Species not listed in the above categories that have a limited range in a bioregion
L	Local	Local. All other native species are considered at least local significance due to the level of habitat depletion in the City of Casey.

Common Name According to Atlas of Victorian Wildlife

Scientific Name According to Atlas of Victorian Wildlife

International Significance	Migratory species protected under international treaties (JAMBA, CAMBA, ROKAMBA and Bonn) or listed on the IUCN Red Data List 2006 as threatened
National Significance	Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* as extinct, extinct in the wild, critically endangered, endangered or vulnerable.
State Significance	Species listed as Threatened under Schedule 2 of Victoria's *Flora and Fauna Guarantee Act 1988* Species listed as extinct, critically endangered, endangered, vulnerable in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007)

Regional Significance	Species listed as data deficient or near threatened in Victoria *Advisory List of Threatened Vertebrate Fauna in Victoria - 2007* (DSE 2007)
	Species not listed in the above categories that have a limited range in a bioregion
Local Significance	Species considered rare, threatened or uncommon within the local area (5km radius from the study area) by the authors with consideration given to previous studies. Many native species are considered to be locally significant within urban areas due to typically high levels of habitat alteration.

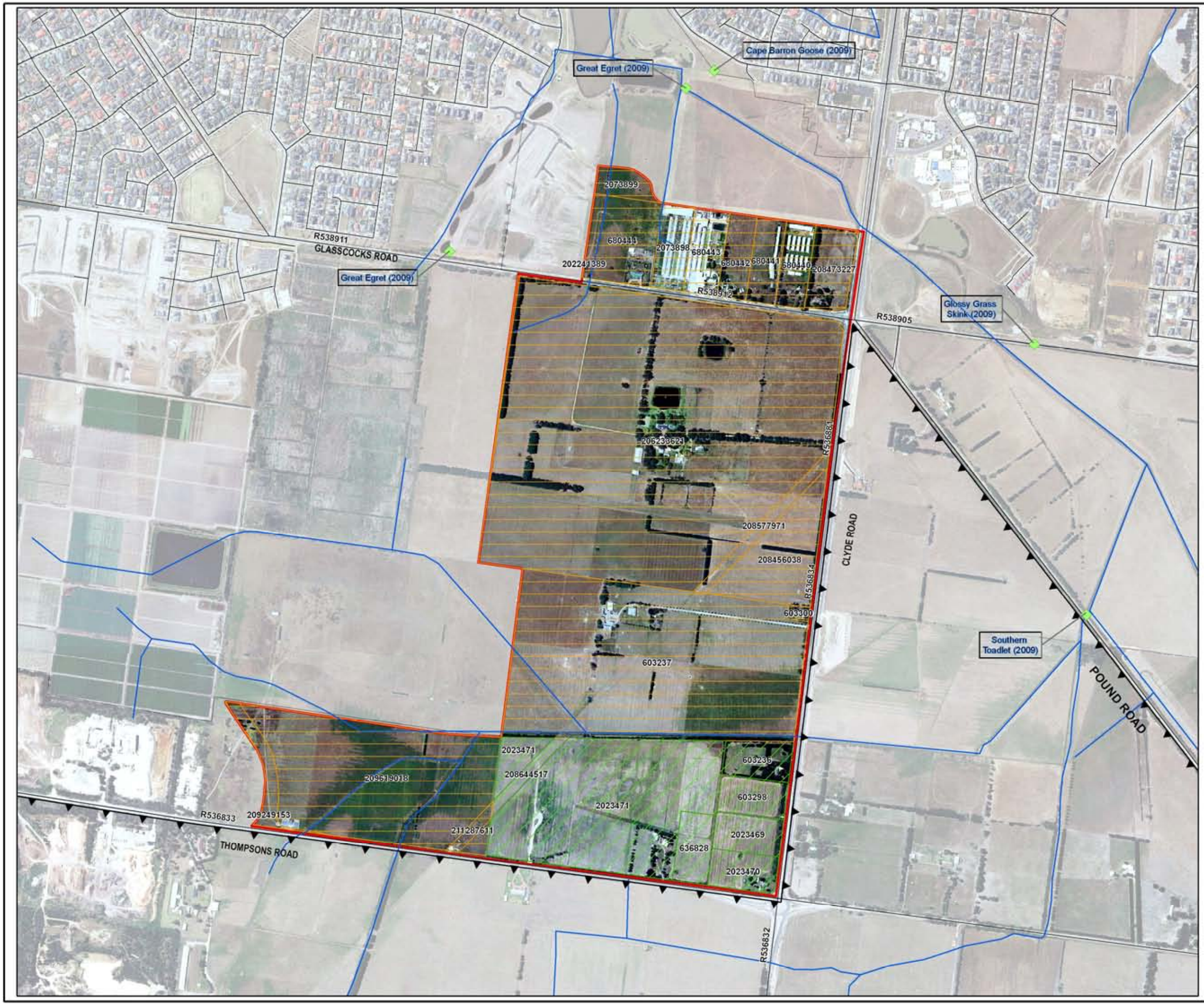

FIGURE 2
Significant Species Distribution
Precinct 16 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- R539084 Road PFI
- Property Boundary
- 633479 Parcel PFI
- Watercourses
- Precinct Boundary
- Study Area Boundary
- Urban Growth Boundary
- Property accessed for fauna surveys
- Property not accessed for fauna surveys

Significant Species

- Database Records of Species of State Significance
- Blue-billed Duck (1998) State Significant Species and Date of Record

MAP AND SURVEY DETAILS

Surveyed by: Joy MacDonald, Mark Shepherd, Peter Gannon, Greg James and David Fairbridge, Oct '08-May'09
Mapping by: Staci Timms and Jo Henry, May '09
Generated from: data collected in the field using Trimble and IPAQ PDAs and aerial photograph interpretation. GIS layers and Aerial Photography supplied by DSE and GAA.

DATUM: GDA 94 MGA Zone 55

N

0 100 200 300 400 500
Metres

1:10,000

NOTES:
Practical Ecology bears no responsibility for the accuracy and completeness of this information and any decisions or actions taken on the basis of the map. While information appears accurate at publication, nature and circumstances are constantly changing.

VERSION	03	DATE	29/04/10

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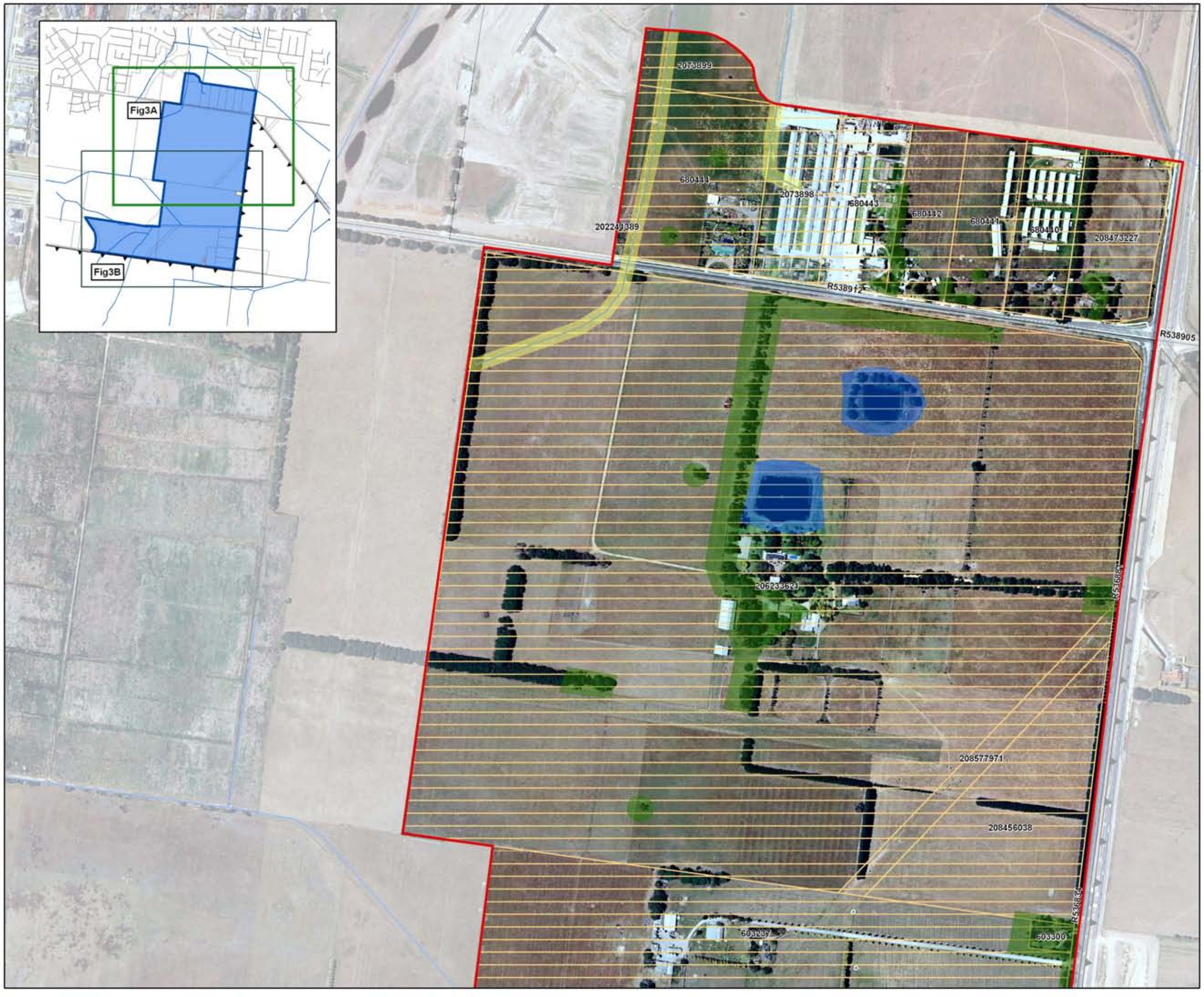

FIGURE 3A
Areas of High Fauna Habitat Value for Significant Species
Precinct 16 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Properties assessed
- Properties not assessed

Areas of High Faunal Habitat Value for Significant Species*

- Drainage Lines
- Swamp Scrub
- Wetland
- Woodland#

* derived from existing information; flora mapping and aerial photography

Woodland indicated are those that are defined by the presence of indigenous and non-indigenous flowering Eucalypts.

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DATUM: GDA 94 MGA Zone 55

N

0 50 100 150 200 250
Metres

1:5,000

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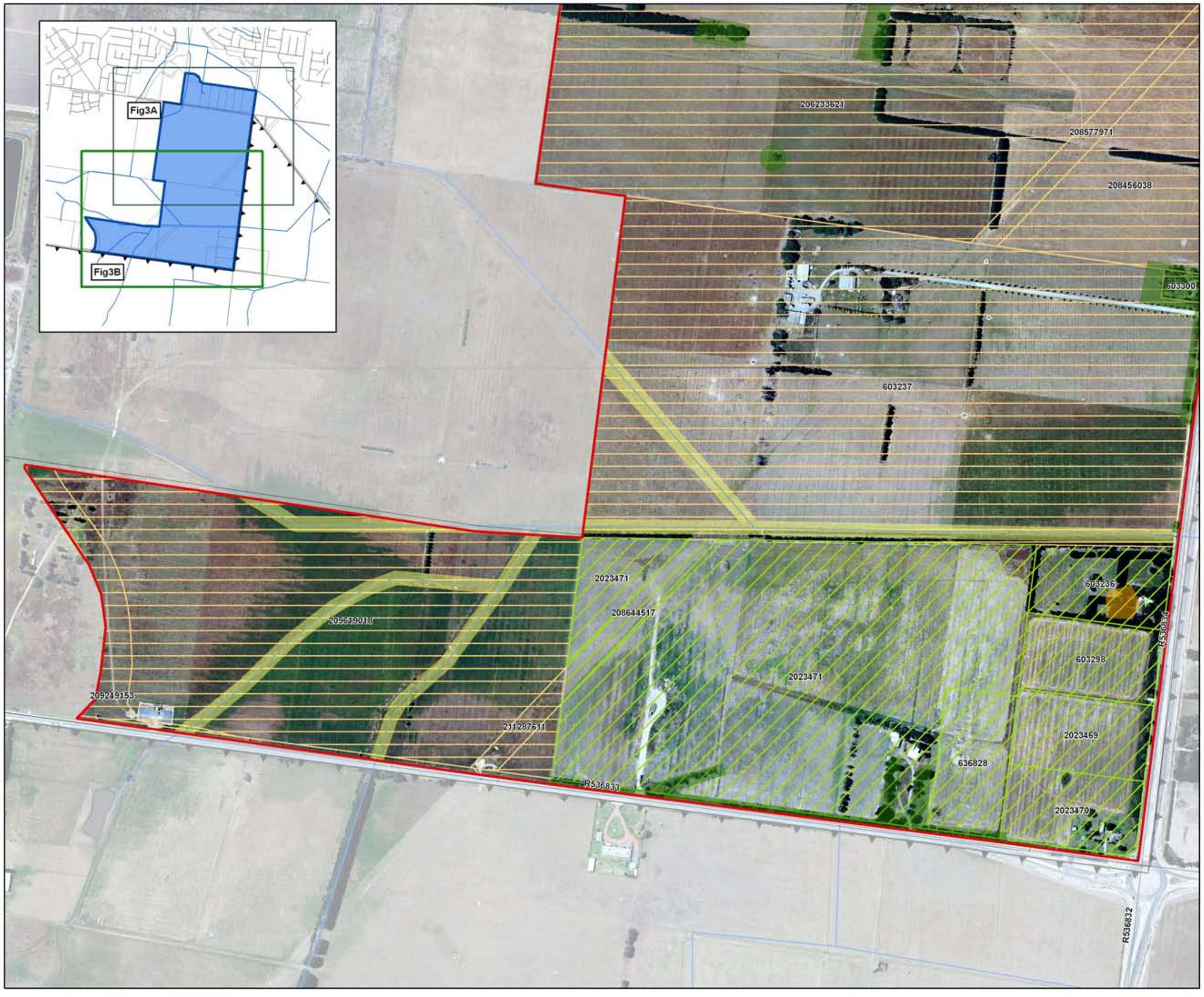

FIGURE 3B
Areas of High Fauna Habitat Value for Significant Species
Precinct 16 Study Area
Biodiversity Assessment Report
Fauna Assessment and Mapping
Cranbourne North (Stage 2)
Growth Areas Authority

LEGEND

- Roads
- Watercourses
- Property Boundary
- Precinct Boundary
- Urban Growth Boundary
- Properties assessed
- Properties not assessed

Areas of High Faunal Habitat Value for Significant Species*

- Drainage Lines
- Swamp Scrub
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